MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINES AND RECLAMATION BUREAU

ABANDONED HARDROCK MINE PRIORITY SITES

PROJECT REPORT

Madison County (South Boulder District)
Through
Madison County (Washington District)

Madison County (Cont'd)

South Boulder	Mammoth	PA # 29-008
	Mammoth Tailings	PA # 29-082
Tidal Wave	B&H	PA # 29-083
	Dry Gulch (South)	PA # 29-282
	Eleanor East	PA # 29-285
	Pete & Joe	PA # 29-449
	Ohio	PA # 29-473
Virgina City	Kearsage	PA # 29-102
	General Shafter	PA # 29-103
	Apex	PA # 29-105
	JTC	PA # 29-106
	Pacific	PA # 29-118
	Easton	PA # 29-121
Washington	Missouri	PA # 29-373
	SE SE S25	PA # 29-394

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MADISON (CONT'D)

SOUTH BOULDER

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: MAMMOTH PA#: 29-008

Date: July 19, 1993 Time: 0930

Field Team Leader: Babits, Pioneer

Sampling Personnel: Pierson, TD&H
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Warm (65°F); partly cloudy to rain; slight breeze; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #3: Adit discharge at level 1 and SW-3 sample location. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Possible to revegetate tailings and waste rock. Adit discharge has near neutral pH; possible treatment required.

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I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): MAMMOTH PA#: 29-008

Legal Description: T 2S ;R 3W ;Sec. 18 , NW1/4 NW1/4 ___1/4

County: MADISON Mining District: SOUTH BOULDER

Latitude: N 45° 40' 00" Longitude: W 112° 00' 40"

Primary Drainage Basin and Code: Missouri River/10020006
Secondary Drainage Basin: Boulder River

USGS Quadrangle map name(s): Manhead Mountain

Mine Type/Commodities: Hardrock/Gold, Silver, Copper

Activity Status: Active___,Inactive/Exploration___,Abandoned X .

Ownership status: Known YX N__; private/public? Private/Public
Owner, Agent, or Contact(Include address and phone when available): Edison and Lucille Workman, P.O. Box 4, Cardwell, MT 59721. (406) 287-5784; Beaverhead National Forest.

Relationship to other mines/sites in the area/district: Mill at Mammoth mine produced tailings at Mammoth Tailings. Appears to be a westward extension of Mineral Hill Zone, which the Boss Tweed mine occurs on.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? No permit known; some diversion of water off of tailings and damming of tailings with wood.

General site features: Elevation 6400'-6600', Slope 34° ,
Aspect West

Land use: Mining___, Recreational X , Residential___, Urban___,
Agricultural X , Other(Specify)___

Area of disturbed/unvegetated lands? 2 acres.
Dimensions:___

Predominant vegetation types: Lodgepole and Ponderosa pines

Access: roads - good X ,poor___,4wd___,trail___.
Other logistical considerations (proximity to other sites).___

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 16 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Gold ore in Mammoth fault zone separating Pony Gneiss from Cherry Creek gneiss. Park Creek flows to the south (has been diverted away from site) of the site. South Boulder River flows to the west of site; discharge of adit enters river. Static water level in monitoring well approx. 1 mile north is 12 feet.

Mining/milling history, ore type/tenor, host rock, gangue: Mining occurred from 1880 to 1934 with the mill operating from 1925 to 1934. Mammoth shows production of 78,750 oz. Au, 159,000 oz. Ag, and 1.54 million lbs. Cu recovered from Mammoth from 1901 through 1961. Country rock is gneiss with fissure veins containing the ore.

Mine Operation?
Shafts - Yes X , No ___, # 1 , Comment 1 open
Adits - Yes X , No ___, # 7 , Comment 2 open
Pits - Yes ___, No X , # ___, Comment
Placers - Yes ___, No X , # ___, Comment
Other - Yes ___, No X , # ___, Comment

Mill Operation? Yes X , No ___. If yes answer the next three questions:

Period(s) of Operation: 1925 to 1934

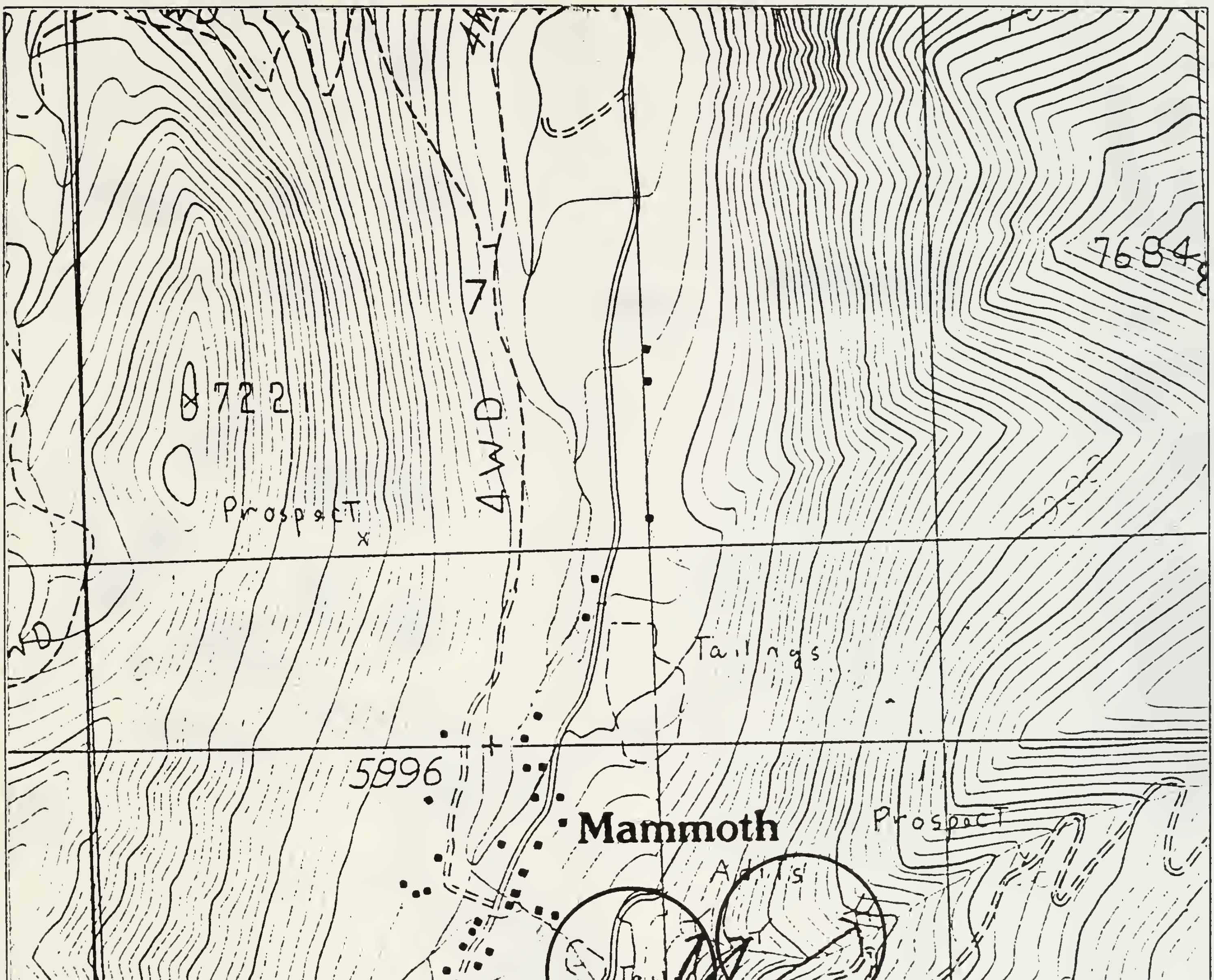
Origin of Ore Milled - Custom Mill ___ Dedicated Mill X ; Number and names of mines that supplied mill feed: Unknown

Process? Hg-amalgam, CN$^-$ leach (vat, heap), floatation, smelting?
Floatation

Montana Bureau of Mines and Geology
Water Well Log Data

11/03/1993

Well No.	Location	Depth	Yield	Static Water Level
M:107318	02S 03W 07 DB	95.0	8.0	60.00
M:125638	02S 03W 07 DD	70.0	15.0	46.00
M:107321	02S 03W 18	150.0	4.0	20.00
M:127913	02S 03W 18	60.0	20.0	15.00
M:107320	02S 03W 18	202.0	8.0	20.00
M:107319	02S 03W 18	50.0	25.0	21.00
M:107322	02S 03W 18 ADD	35.0	0.0	0.00
M:107323	02S 03W 18 B	81.0	17.0	18.00
M:107324	02S 03W 18 BA	160.0	20.0	40.00
M:128046	02S 03W 18 BA	110.0	20.0	30.00
M:107325	02S 03W 18 BAA	19.0	10.0	9.00
M:107326	02S 03W 18 BAA	0.0	10.0	0.00
M:107327	02S 03W 18 BB	260.0	30.0	52.00
M:107328	02S 03W 18 BBB	0.0	7.0	130.00
M:125639	02S 03W 18 BDB	47.0	15.0	13.00
M:107329	02S 03W 21 CBC	81.0	0.0	59.00

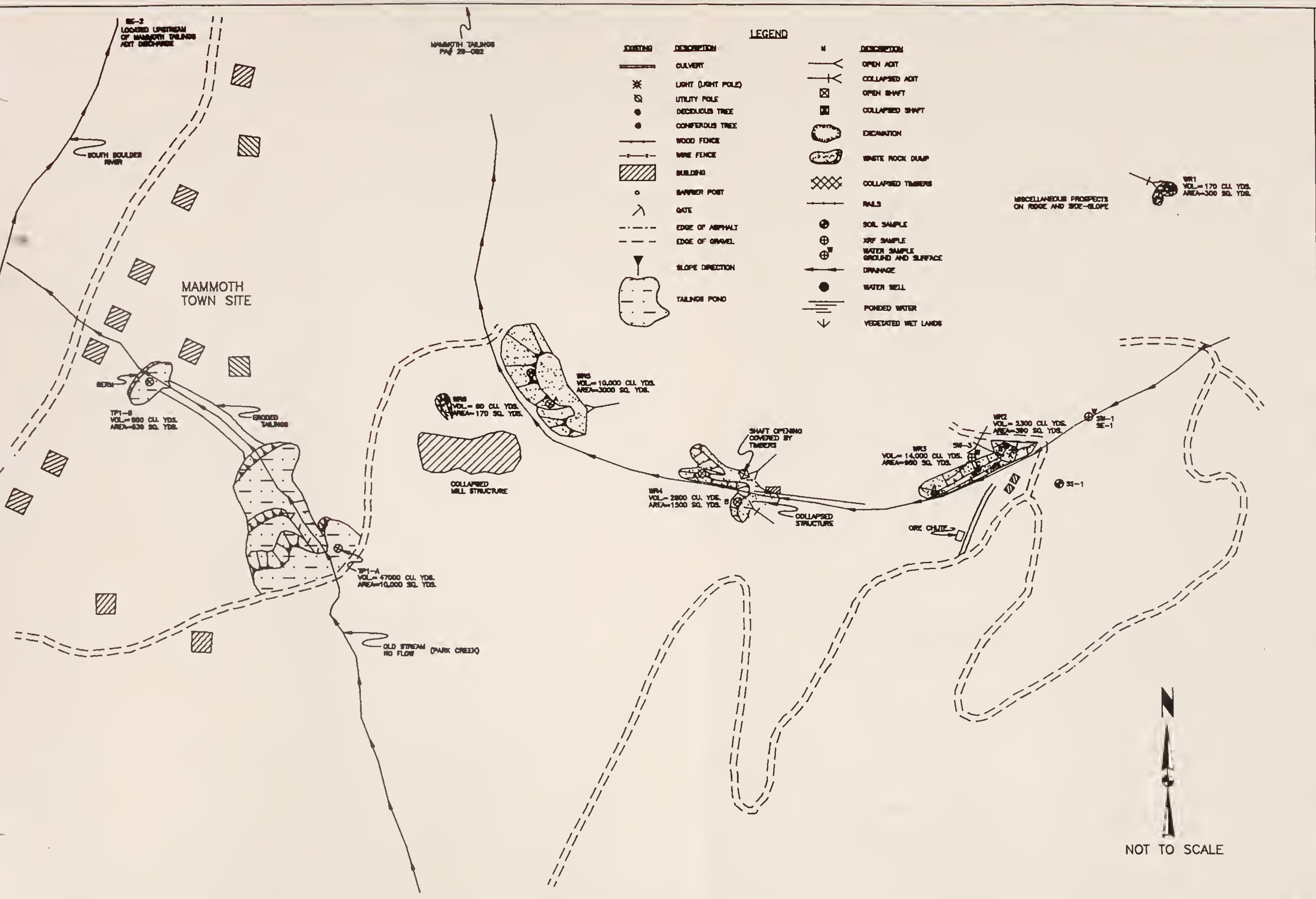


PIONEER
TECHNICAL SERVICES, INC.

MAMMOTH, P.A. NO. 29-008

T02S, R03W, SECTION 18

SCALE: 1' = 1000'



DRAWN JTP DATE 21 OCT 93
DESIGNED TPR JOB NO. 93-17
APPROVED WJB F.B. NO.

PIONEER TECHNICAL SERVICES, INC. BUTTE, MT.

TDH

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS–BOZEMAN–KALISPELL MONTANA
SPOKANE WASHINGTON

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

MAMMOTH PA# 29-008

SOUTH BOULDER DISTRICT MADISON COUNTY

SHEET NO.

29-008.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): Fine sand with layers of clay

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Deepest depth is 14 feet; shallowest is 4.5 feet.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Wet

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): A small attempt to control tailings with wooden posts; all historic structures are gone.

Comments on potential for mitigation: Revegetate

SOURCE INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1	WR	170	Level 1, upper adit waste rock furthest east; center of dump	None	6.8 (D)	0.05	29-008-WR-1	07/19/93 1020	T-Metals, ABA
WR-2A	WR	2,300	Level 1, road waste rock; east side of dump	None	5.8 (D)	0.05			
WR-2B	WR		Level 1, road waste rock; west side of dump	None	5.6 (D)	0.05			
WR-3A	WR	14,000	Level 1, west side of lowest dump, furthest south hole	None	6.2 (D)	0.05			
WR-3B	WR		Level 1, east side of lowest dump, middle hole	None	6.0 (D)	0.05			
WR-3C	WR		Level 1, center of lowest dump, furthest north hole	None	5.8 (D)	0.05			
WR-4A	WR	2,800	Level 2, north side of creek	None	6.2 (D)	0.04	29-008-WR-2	07/19/93 1030	T-Metals, ABA
WR-4B	WR		Level 2, south side of creek	None	6.4 (D)	0.05			
WR-5A	WR	10,000	Level 3, north side of dump	None	< 3.5 (D)	0.05			
WR-5B	WR		Level 3, south side of dump	None	3.8 (D)	0.04			
WR-6	WR	80	Level 3, top of east side of dump	None	3.8 (D)	0.04			
TP-1A-A	TAIL	47,000	East side of pond; 0-4'	None	6.0 (D)	0.04	29-008-TP-1	07/19/93 1510	T-Metals, ABA
TP-1A-B	TAIL		East side of pond; 4-5'	None	4.4 (D)	0.05	29-008-TP-2	07/19/93 1515	T-Metals, ABA
TP-1A-C	TAIL		East side of pond; 5-8'	None	5.4 (D)	0.04			
TP-1A-D	TAIL		East side of pond; 8-14'	None	5.8 (D)	0.04			
TP-1A-E	TAIL		East side of pond; 14'	None	NM	0.04			
TP-1B	TAIL	950	West side of pond; 0-4.5'	None	5.6 (D)	0.04			
SS-1	BKGRND	N/A	Background soil	N/A	6.6 (D)	NM	29-008-SS-1	07/19/93 1230	T-Metals

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 29-008-WR-1 is composite of WR-1, WR-2A and -2B, and WR-3A through -3C. 29-008-WR-2 is composite of WR-4A and -4B, WR-5A and -5B, and WR-6. 29-008-TP-1 is composite of TP-1A-A and TP-1B. 29-008-TP-2 is composite of TP-1A-B through -1A-E.
NM = Not Measured

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes_X_, No___, Number:_1_ Identification:_Collapsed adit on Level 1_

Filled shafts: Yes_X_, No___, Number:_1_ Identification:_Filled with water on Level 3_

Seeps/Springs: Yes___, No_X_, Number:___ Identification:___

Groundwater wells within 4 miles?: Yes_X_, No___;
Number of well logs:_18_

Distance to nearest well used for drinking?_Approx. 700' (Workman residence)_

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite___, Probable_X_, Possible___, Unlikely___.
Uncontained sources with shallow groundwater; waste rock contain material with only slightly elevated metal values and tailings contain elevated Cu and As metal values.

Other observations/notes:_N/A_

GROUNDWATER INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-3	AD	Adit discharge at Level 1	5 gpm (E)	7.45	144	224	8.0	27	N/A	29-008-SW-3	07/19/93 1350	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No ___, Name(s): Unnamed tributary to South Boulder River

Dry streambeds: Yes X, No ___, Name(s): Park Creek used to flow through tailings.

Other surface water: Yes X, No ___, Name(s)/Description: South Boulder River flows south to north approx. 1/4 mile west of site; on-site adit discharges to tributary which discharges to river.

Waste materials within any floodplain: Yes X, No ___ Source ID(s): WR and Tailings in tributary

Approximate Flood frequency? X 1 yr, ___10 yr, ___100 yr

Estimated seasonal flow of stream(s) (cfs)? 10 gpm during sampling
High Flow: 100 gpm, Average Flow: 10 gpm

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes ____, No X,
Describe:

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Fishery, irrigation, wetland

Observed erosional/sedimentation/stream turbidity problems? Yes ____, No X, Distance downstream (ft)? ________ Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Unnamed tributary looks clear on the site, but erosional problems downgradient.

SURFACE WATER INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Upgradient in unnamed tributary	7.75	147	193	10.4	0	10 gpm (E)	29-008-SW-1	07/19/93 1220	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	Upgradient in unnamed tributary	N/A	N/A	N/A	N/A	N/A	N/A	29-008-SE-1	07/19/93 1220	T-Metals
SE-2	SE	In Boulder Creek above confluence with unnamed tributary with adit discharge	N/A	N/A	N/A	N/A	N/A	N/A	29-008-SE-2	07/19/93 1550	T-Metals
SW-1	SW	Downgradient in unnamed tributary	7.88	290	239.6	8.5	20	1.6 cfs (M)	29-082-SW-1	07/19/93 1100	T-Metals
SE-3	SE	In Boulder Creek below confluence with unnamed tributary	N/A	N/A	N/A	N/A	N/A	N/A	29-082-SE-3	07/19/93 1545	T-Metals

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? None; very steep, home surrounds

Wetlands present: Yes X , No___, Describe: Streamside

Carbonate rocks/soils: Yes___, No X , Describe:___

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30___; 30-100 X ; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments___

Nearest residence(ft or miles)? 20 feet

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	SO3	Wet	2,700	2,700	Yes	Low
WR-2	SO3	Wet	3,420	3,420	Yes	Low
WR-3	SO3	Wet	8,550	8,550	Yes	Low
WR-4	SO3	Wet	13,500	13,500	Yes	Low
WR-5	SO3	Wet	27,000	27,000	Yes	Low
WR-6	SO3	Wet	1,530	1,530	Yes	Low
TP-1	pH	Wet	95,670	95,670	Yes	High

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes_X_, No____,
Describe: Homes (seasonal) within 20'

Population within 1 mile: 1-10___; 10-30_X_; 30-100___; 100-300___;
300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments In the summer time

Evidence of recreational use on site: Yes___, No_X_, Describe:_______

Accessibility - Fences, warning signs, closed roads? Cable gate

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment_______
Wilderness Area - Yes___, No_X_, Comment_______
T&E Species Habitat - Yes___, No_X_, Comment_______
Bat Habitat - Yes___, No_X_, Comment_______

Primary Drainage___; Secondary Drainage_X_; No Information___:

Riparian Habitat Quality - High___, Medium___, Low_X_
Wetlands Frontage - High___, Medium___, Low_X_
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _3_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_3_, types and locations:
1 shaft at WR-4; two adits (WR-4 and WR-5)

Hazardous structures: Yes___, No_X_, Number____, types and locations:_

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____,
types and locations:_______

Unstable waste piles, impoundments, undercut banks: Yes____, No_X_,
Number____, types and locations:_______

Fire and/or Explosion hazards: Yes___, No_X_, Explain:_______

Bibliography

MBMG, Mammoth, Madison County, Form 39, 1980-1983, and 1985-1987.

MBMG, Mineral and Industry File 90.0, Mammoth Mine, Madison County, Montana.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDHES/WQB, Monitoring Data for the Mammoth Area, May 28, 1979, February 20, 1980, and April 23, 1980.

MDSL/AMRB Files, Abandoned Mine Lands National Inventory, Phase II Problem Area Data Sheet for Mammoth, Prepared by Mark Carlstrom, February 20, 1980.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Mammoth, Prepared by Northern Engineering and Testing, April 28, 1987.

MDSL/AMRB Files, Memo to Ben Mundie, MDSL/AMRB, From Roger Braun, Northern Engineering and Testing, Inc., Regarding the Mammoth Mine Site Visit, May 1, 1987.

Northern Engineering and Testing, Inc., Pre-Design Inventory of the South Boulder River Drainage, Madison County, Montana, 1987 Abandoned Mine Reclamation Program, February 17, 1988.

USBM, Mineral Investigation of the Middle Mountain-Tobacco Root Rare II Area (No. B1013), Madison County, Montana, Summary Report, Written by Eric E. Cather and J. Mitchell Linne, 1983.

USGS, Topographic Map, Manhead Mountain, Montana, 7 1/2 minute Quadrangle, 1989.

LABORATORY ANALYTICAL DATA

MAMMOTH
PA NO. 29-008

Mammoth Mine PA# 29-008

AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BABITS
INVESTIGATION DATE: 07/19/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-008-SE-1	5 U	67.2	1.4 J	5.5	12.1	15	9800	0.259	274	12	12	6 U	28	NR
29-008-SE-2	7 U	31.3	1.8 J	12.4	28	64.4	10300	0.287	377	33	16	8 U	107	NR
29-082-SE-3	103 J	131 J	1.7	19.6 JX	39.2 JX	285 J	27200 J	0.594	723 J	39 J	33	8 UJ	214 J	NR
29-008-TP-1	676	249	2.2 J	2 U	1.9	220	26900	0.372	20.6	3 U	54	6 U	50	NR
29-008-TP-2	704	279	4.9 J	26.2	8	1860	44200	0.851	398	24	90	8 U	293	NR
29-008-WR-1	223	88.3	3.5 J	12.6	16.7	401	38300	1.09	358	20	60	5 U	75	NR
29-008-WR-2	339	143	2.4 J	7	9.6	225	30800	0.474	140	13	87	6 U	66	NR
BACKGROUND	28	174	1.5 J	11	24.3	28.6	15900	0.219	1000	18	23	6 U	47	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
29-008-TP-1	0.15	4.69	-0.7	-5.4	0.13	0.02	<0.01	0.62	-1.31
29-008-TP-2	1.64	51.2	6.66	-45	0.07	1.36	0.21	42.5	-35.8
29-008-WR-1	0.41	12.8	12.1	-0.7	0.25	0.05	0.11	1.56	10.5
29-008-WR-2	0.71	22.2	1.31	-21	0.51	0.06	0.14	1.87	-0.57.

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-008-SW-1	1.69 U	37.9	2.57 U	9.7 U	6.83 U	1.55 U	34.6	0.038 U	4.08 U	12.7 U	1.55 U	30.7 U	7.57 U	44
29-082-SW-1	26.5	18.8	4.77 J	9.7 U	6.83 U	305	2740	0.039	333	16.4	1.85	30.7 U	129	83.1
29-008-SW-3	6.07	33.4	2.57 U	9.7 U	6.83 U	173	420	0.038 U	28.7	12.7 U	1.55 U	30.7 U	24.9	48.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-008-SW-1	127	< 5.0	5	0.08	NR
29-082-SW-1	153	5.3	75	0.11	NR
29-008-SW-3	141	< 5.0	15	0.14	NR

LEGEND

SE1 - Upgradient in unnamed tributary.
SE2 - In Boulder Creek above confluence of unnamed tributary with adit discharge.
29-082-SE3 - Downgradient of site on South Boulder River.
TP1 - Composite of subsamples TP1A-A and 1B.
TP2 - Composite of subsamples TP1A-B, 1A-C, 1A-D, and 1A-E.
WR1 - Composite of subsamples WR1, 2A, 2B, 3A, 3B, and 3C.
WR2 - Composite of subsamples WR4A, 5A, 5B, and 6.
BACKGROUND - From Mammoth Mine (29-008-SS-1).

SW1 - Same as sample SE1.
29-082-SW1 - At PPE of adit discharge and unnamed tributary to S. Boulder River.
SW3 - Adit discharge at Level I.

XRF ANALYSIS RESULTS

MAMMOTH
PA NO. 29-008

Mine Name: Mammoth PA# 29-008
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
29-008-SS-1		14659.4	13545.4	2465.93		1733.3	27458.9			64.0876 *	38.735 *	247.746
29-008-TP1A-A		23434.4	1240.1	993.116			14530.5				727.882	30.8071
29-008-TP1A-B		27596	2738.8	1901.45		572.291 *	42308.8		990.31	302.046	900.809	41.7725
29-008-TP1A-C		25119	2014.83	1748.37			28047.8		1354.68	178.669	433.576	50.3231
29-008-TP1A-D		25628.5	3166.09	2042.03		527.597 *	44686.2		1268.82	215.16	738.885	47.2382
29-008-TP1A-E		18800.7	6435.63	2743.63		411.844 *	48687.9		874.383	134.101 *	513.824	149.024
29-008-TP1-B		16687.5	1041.73	1284.81			19796		170.915 *	55.7525 *	438.145	33.9198
29-008-TP-1-COMP		21948.5	1286.39	1444.07			20297.1		118.851 *		568.669	34.2099
29-008-TP-2-COMP		28273	2995.89	2180.76		430.98 *	43150.7		1212.21	270.509	815.397	49.6052
29-008-WR2-A		22684.5	2953.25	2171.87	172.63 *	535.522 *	86518.4		678.254	119.257 *	1121.2	118.736
29-008-WR2-B		20521.2	6519.42			1447.85	45579.8		515.078	133.615 *	136.121	92.8388
29-008-WR3-A		23210.8	23196.7	1562.59		1214.51 *	57712.9		362.655	148.659 *	118.381 *	52.8672
29-008-WR3-B		30142.9	1363.82	1363.86			58204.6		467.438		1077.43	52.1991
29-008-WR3-C	323.953 *	16904.1	7933.95	3645.29		1178.02 *	66078.9		460.309	95.282 *	145.543	134.953
29-008-WR4-A		37314.9	2118.65	1058.43			36409.9				617.596	68.4655
29-008-WR4-B		27493	1922.53	970.677			67009.4		117.834 *	86.1793 *	882.087	63.5637
29-008-WR5-A		10069.7	1416.36	1364.74			97074.7		301.63	65.3527 *	788.096	128.418
29-008-WR5-B		11223.3	9763.09	3127.58			93398.6		394.481	118.12 *	1703.34	98.5799
29-008-WR-1	501.811 *	18386	15933	4130.11		1204.34 *	67930.8		503.132	48.0258 *	33.7188 *	246.773
29-008-WR-1-COMP		22629.7	7620.88	2727.61		1069.13 *	54721.9		588.769		429.555	102.18
29-008-WR-2-COMP		24368.4	7280.51	1953.36	188.492 *	559.653 *	66828.4		330.735		794.181	107.69
29-008-WR-6		17226.4	12716	1538.33		847.814 *	48243.1		723.339	246.167	467.085	102.539

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
29-008-SS-1	192.673				73.6052			481.395			
29-008-TP1A-A	225.805		10.6824 *		94.8341			739.901		13.1434 *	11.2862 *
29-008-TP1A-B	165.05		9.66269 *		150.765			705.242			16.5387 *
29-008-TP1A-C	208.479				79.2405			643.284	94.8075 *	11.1926 *	21.4119 *
29-008-TP1A-D	187.935				75.6188			509.241	161.888 *		18.0992 *
29-008-TP1A-E	238.576				79.3574	218.722 *		737.502		11.4427 *	18.7121 *
29-008-TP1-B	172.506				61.1068			461.039	61.4185 *	12.1905 *	12.0821 *
29-008-TP-1-COMP	199.57		6.16952 *		82.2816			684.491			17.5483 *
29-008-TP-2-COMP	202.236		6.79691 *		108.095			703.075	88.7251 *		21.9882 *
29-008-WR2-A	243.981		7.72096 *		143.974			878.302	102.079 *		11.1773 *
29-008-WR2-B	311.74				113.284			809.882	88.988 *	16.8596 *	15.069 *
29-008-WR3-A	434.425			45.51 *	123.504			629.212		18.9615 *	18.3495 *
29-008-WR3-B	437.483		7.5713 *	79.3401 *	154.774	142.954 *		1255.66		16.1039 *	15.6414 *
29-008-WR3-C	227.14				79.944			508.474			7.4696 *
29-008-WR4-A	245.36		17.0963 *		150.095		45.3694 *	1327.99	100.493 *		26.1404 *
29-008-WR4-B	217.012		11.5488 *		155.295			1107.22	94.7018 *	15.0526 *	14.5267 *
29-008-WR5-A	177.743	63.1582 *	8.67769 *		78.0117			1017.8			21.0593 *
29-008-WR5-B	188.286				89.4369			730.585	124.313 *		8.29306 *
29-008-WR-1	148.148				118.268			787.877			
29-008-WR-1-COMP	398.323				125.756			609.135	134.483 *	15.3348 *	15.0444 *
29-008-WR-2-COMP	345.856		6.93276 *		149.939	214.723 *		1116.19			20.5273 *
29-008-WR-6	222.046				120.322			856.717			14.3531 *

* – Estimated Quantity
$ – Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

MAMMOTH
PA NO. 29-008

MDSL AMRB/PIONEER 4/9/93

AIMSS SCORESHEET

SITE NAME: MAMMOTH
PA NUMBER: 29-008

LINE NO.				
		GROUNDWATER PATHWAY		
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	35.792
6		WELLS - 1 MI. x 2.5		40.0
7	GW - TARGETS	WELLS - 1 TO 4 MI		2
8		NEAREST WELL		10
9		TARGETS SCORE	LINES 6 + 7 + 8	52.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	744474
		SURFACE WATER PATHWAY		
11		OBSERVED RELEASE		300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		50
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	750
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	38.168
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19	SW - TARGETS	FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	18
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	515268
		AIR PATHWAY		
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		10
26B		DISTANCE TO POPULATION		20
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	200
27		LIKELIHOOD SCORE	LINES 25 + 26C	200
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.137
29		POPULATION - 4 MILES		30
30		NEAREST RESIDENCE		10
31	AIR - TARGETS	WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	40
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	1096
		DIRECT CONTACT PATHWAY		
36		OBSERVED EXPOSURE		200
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		10
37B		DISTANCE TO POPULATION		20
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	200
38		LIKELIHOOD SCORE	LINES 36 + 37C	400
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.129
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		10
41		NEAREST RESIDENCE		10
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 THRU 42	20
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	1032
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000			**12.62**

			SITE NAME:	MAMMOTH
			PA NUMBER:	29-008
LINE NO.		**SITE SAFETY**		
1	THREAT	ACCESSIBILITY		10
2		OPEN SHAFTS	100 EA.	100
3		OPEN ADITS	50 EA.	100
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	200
9		POPULATION - 1 MILE		10
10	TARGETS	NEAREST RESIDENCE		10
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 THRU 11	20
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**40.00**

SUMMARY OF HISTORICAL ANALYTICAL DATA
FROM OTHER SOURCES

ENERGY LABORATORIES

ENERGY LABORATORIES, INC.
P.O. BOX 30916 • 1107 SOUTH BROADWAY • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325

LABORATORY REPORT

(1)

Lab No.: 87-2953
Date: 4-2-87 tab

To: Radersburg Mining Co.
Address: Box 25-A
Parker Loop
Toston, Montana 59643
ATTN: Bobby Lavinder

WATER ANALYSIS

Portal - Mammoth
Sampled 3-18-87 pm
Submitted 3-25-87

CONSTITUENT	mg/l
Calcium	110
Magnesium	65
Sodium	11
Potassium	3
Bicarbonate as CaCO3	114
Sulfate	437
pH	7.4 standard units
Specific Conductance @ 25°C	950. umhos/cm

METALS:

	mg/l	
	Dissolved	Total Recoverable
Arsenic	<0.005	0.010
Lead	<0.01	<0.01
Chromium	<0.02	<0.02
Cadmium	<0.001	<0.001
Zinc	0.03	0.07
Iron	<0.03	1.05
Copper	<0.01	0.09

RECEIVED JUL 06 1987

ANALYTICAL REPORT

MOUNTAIN
STATES
ANALYTICAL

July 2, 1987
Job No: 87-911
Sheet No. 1 of 2
Invoice No. 870702-01

NORTHERN ENGINEERING AND TESTING, INC.
ATTN: MR. ROGER BRAUN
P O BOX 4699
HELENA MT 59604

Report of: Water Analysis - Mammoth

Sample Identification:

On June 9, 1987, these water samples were delivered to our laboratory for analysis. Tests were conducted in accordance with the U.S. Environmental Protection Agency Manual EPA 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes." The results of the analysis are shown on the following page.

Reviewed by Deborah A. [illegible]

rmr

Mountain States Analytical

WATER ANALYSIS
MAMMOTH
87-3001-I

July 2, 1987
Job No. 87-911
Sheet 2 of 2

TEST RESULTS:

Lab No.:	89611	89612	89613	89614	
Sample Description:	Level 1 Adit	Level 1 Waste	Level 3 Waste	Level 5 Adit	
Date Sampled:	6/07/87	6/07/87	6/07/87	6/07/87	Date Analyzed
Calcium as Ca, mg/l	8	9	9	11	6/09/87
Magnesium as Mg, mg/l	15	3	3	4	6/09/87
Sodium as Na, mg/l	3	3	3	3	6/09/87
Potassium as K, mg/l	1	<1	<1	1	6/18/87
Bicarbonate as HCO_3, mg/l	30	39	35	41	
Total Alkalinity, mg/l	25	32	29	34	6/09/87
Chloride as Cl, mg/l	1	<1	3	3	6/18/87
Sulfate as SO_4, mg/l	59	10	8	13	6/18/87
Nitrate+Nitrite as N, mg/l	0.16	0.23	0.15	0.22	6/22/87
Total Cyanide as CN, mg/l	<0.010	<0.010	<0.010	<0.010	6/16/87
Dissolved Metals, mg/l					
Arsenic as As	<0.005	<0.005	<0.005	<0.005	6/10/87
Chromium as Cr	<0.02	<0.02	<0.02	<0.02	6/11/87
Copper as Cu	0.05	0.06	<0.02	0.07	6/11/87
Iron as Fe	<0.05	<0.02	<0.02	<0.02	6/11/87
Lead as Pb	<0.02	<0.02	<0.02	<0.02	6/11/87
Zinc as Zn	0.10	0.02	<0.02	0.03	6/11/87

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-HEALTH DEPT.        WATER QUALITY BUREAU         HELENA, MONTANA  59601

   STATE   MONTANA                                 COUNTY  MADISON
AT.-LONG.  454024N 112 044W             SAMPLE LOCATION   2S   3W   7D
TION CODE                               ANALYSIS NUMBER   79W1273
E SAMPLED  06-28-79                      DRAINAGE BASIN   0410 -JEFFERSON
E SAMPLED                               WATER FLOW RATE
C SAMPLED                       FLOW MEASUREMENT METHOD
LE SOURCE                      ALTITUDE OF LAND SURFACE
 WATER USE                    TOTAL WELL DEPTH BELOW LS
QUIFER(S)                      SWL ABOVE(+) OR BELOW LS
AMPLED BY  WQBH                SAMPLE DEPTH BELOW SURFACE

   SAMPLING SITE: DISCHARGE FROM MAMMOTH MINE ADIT

           MG/L      MEQ/L                               MG/L      MEQ/L
LCIUM (CA)                          BICARBONATE(HCO3)
ESIUM (MG)                            CARBONATE (CO3)
ODIUM (NA)                             CHLORIDE   (CL)
SSIUM  (K)                              SULFATE (SO4)
                                       FLUORIDE    (F)
                                  PHOSPHATE(PO4 AS P)
                                   NO3+NO2 (TOT AS N)

                -------   ------                      ------    ------
SUM CATIONS       0.0       0.0            SUM ANIONS   0.0      0.000

         LABORATORY PH        7.59      TOT HARDNESS(MG/L-CACO3)
D WATER TEMPERATURE (C)               TOT ALKALINITY(MG/L-CACO3)
-DISS. IONS MEAS.(MG/L)               LABORATORY TURBIDITY (NTU)
CONDUCTIVITY-UMHOS-25C   184.0          SODIUM ADSORPTION RATIO

          ADDITIONAL          PARAMETERS
RSENIC,TR (MG/L AS AS)     .020      CADMIUM, TR (MG/L AS CD)      < .001
COPPER,TR (MG/L AS CU)     .19          LEAD,TR (MG/L AS PB)       < .005
 ZINC,TR (MG/L AS ZN)      .040         IRON,TR (MG/L AS FE)        1.6




ARKS: - AMBIENT MONITORING

PLANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
 CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
MPLE NO            SAMPLER  PCG      HANDLING          ANALYST  WRK   LAB  WQBH
MPLETED 07-13-79  COMPUTER RUN 08/01/79  DATA C975/PROG C876 FUND 6150
NC DEV. ION BALANCE  0.00      CA    MG    NA    K    CL   SO4  HCO3  CO3  NO3
GMENT      MPDES               0.0   0.0   0.0  0.0 33.3 33.3  0.0  33.3  0.0
LC. MEQ/L= INSUFFICIENT DATA                                          79W1273
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E HEALTH DEPT.          WATER QUALITY BUREAU          HELENA, MONTANA  59601

      STATE   MONTANA                                  COUNTY  MADISON
  LAT.-LONG.  454024N 112 044W              SAMPLE LOCATION    2S  3W  7D
ATION CODE                                  ANALYSIS NUMBER  79W1274
TE SAMPLED    06-28-79                       DRAINAGE BASIN  C41G -JEFFERSON
ME SAMPLED                                  WATER FLOW RATE        1.  CFS(E)
OD SAMPLED                           FLOW MEASUREMENT METHOD
PLE SOURCE                           ALTITUDE OF LAND SURFACE
  WATER USE                         TOTAL WELL DEPTH BELOW LS
 AQUIFER(S)                          SWL ABOVE(+) OR BELOW LS
 SAMPLED BY   WQBH                  SAMPLE DEPTH BELOW SURFACE

      SAMPLING SITE: ~~MAMMOTH MINE ADIT BELOW~~ TAILINGS

                   MG/L      MEG/L                                MG/L      MEG/L
ALCIUM  (CA)                           BICARBONATE(HCO3)
NESIUM  (MG)                             CARBONATE (CO3)
SODIUM  (NA)                              CHLORIDE  (CL)
ASSIUM   (K)                               SULFATE (SO4)
                                          FLUORIDE   (F)
                                      PHOSPHATE(PO4 AS P)
                                       NO3+NO2 (TOT AS N)
                  ------     ------                              ------      ------
 SUM CATIONS       0.0        0.0                  SUM ANIONS     0.0        0.000

          LABORATORY PH          7.73      TOT HARDNESS(MG/L-CACO3)
LD WATER TEMPERATURE (C)                  TOT ALKALINITY(MG/L-CACO3)
-DISS. IONS MEAS.(MG/L)                   LABORATORY TURBIDITY (NTU)
 CONDUCTIVITY-UMHOS-25C  188.4              SODIUM ADSORPTION RATIO

                A D D I T I O N A L   P A R A M E T E R S
RSENIC,TR (MG/L AS AS)       .052      CADMIUM, TR (MG/L AS CD)      < .001
 COPPER,TR (MG/L AS CU)      .45           LEAD,TR (MG/L AS PB)        .010
   ZINC,TR (MG/L AS ZN)      .073          IRON,TR (MG/L AS FE)      15.

MARKS:  AMBIENT MONITORING

PLANATION: MG/L=MILLIGRAMS PER LITER  MEG/L=MILLIEQUIVILENTS PER LITER
L CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
PPLE NO            SAMPLER  PCG    HANDLING           ANALYST  WRK    LAB  WQBH
MPLETED 07-13-79   COMPUTER RUN 08/01/79   DATA 0975/PROC 0876 FUND 6150
ND DEV. ION BALANCE  0.00      CA    MG    NA    K    CL   SO4   HCO3  CO3  NO3
OMMENT    HPDES                0.0   0.0   0.0  0.0  33.3 33.3   0.0 33.3  0.0
                                                                        79W1274
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HEALTH DEPT.        WATER QUALITY BUREAU          HELENA, MONTANA  59601

                                                     COUNTY  MADISON
   STATE   MONTANA                             SAMPLE LOCATION  2S  3W  7D
AT.-LONG.  454024N 112 044W                    ANALYSIS NUMBER  79W1271
TION CODE
E SAMPLED  06-28-79                             DRAINAGE BASIN  0416 -JEFFERSON
E SAMPLED                                      WATER FLOW RATE    100.  CFS(E)
D SAMPLED                              FLOW MEASUREMENT METHOD
LE SOURCE                              ALTITUDE OF LAND SURFACE
WATER USE                             TOTAL WELL DEPTH BELOW LS
QUIFER(S)                              SWL ABOVE(+) OR BELOW LS
SAMPLED BY  WQBH                     SAMPLE DEPTH BELOW SURFACE

  SAMPLING SITE: SOUTH BOULDER RIVER ABOVE MAMMOTH MINE

              MG/L       MEQ/L                              MG/L      MEQ/L
LCIUM (CA)                          BICARBONATE(HCO3)
ESIUM (MG)                            CARBONATE (CO3)
DIUM  (NA)                             CHLORIDE  (CL)
SSIUM  (K)                              SULFATE (SO4)
                                       FLUORIDE    (F)
                                  PHOSPHATE(PO4 AS P)
                                   NO3+NO2 (TOT AS N)

            ------     ------                        ------      ------
SUM CATIONS    0.0       0.0               SUM ANIONS   0.0       0.000

         LABORATORY PH       7.71      TOT HARDNESS(MG/L-CACO3)
D WATER TEMPERATURE (C)                TOT ALKALINITY(MG/L-CACO3)
DISS. IONS MEAS.(MG/L)                 LABORATORY TURBIDITY (NTU)
 CONDUCTIVITY-UMHOS-25C     84.4          SODIUM ADSORPTION RATIO

              A D D I T I O N A L   P A R A M E T E R S
SENIC,TR (MG/L AS AS)     < .001   CADMIUM, TR (MG/L AS CD)      < .001
COPPER,TR (MG/L AS CU)      .01         LEAD,TR (MG/L AS PB)       .005
  ZINC,TR (MG/L AS ZN)      .005        IRON,TR (MG/L AS FE)       .05

ARKS: - AMBIENT MONITORING

LANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVALENTS PER LITER
 CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
PLE NO          SAMPLER  POG     HANDLING             ANALYST  WRK   LAB  WQBH
PLETED 07-13-79  COMPUTER RUN 08/01/79  DATA 0975/PROG 0876 FUND 6150
RC DEV. ION BALANCE  0.00      CA    MG    NA    K    CL   SO4  HCO3  CO3  NO3
GMENT       MPDES              0.0   0.0   0.0  0.0  33.3 33.3  0.0  33.3  0.0
                                                                     79W1271
LC. MEQ/L= INSUFFICIENT DATA
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HEALTH DEPT.       WATER QUALITY BUREAU          HELENA, MONTANA  59601

      STATE  MONTANA                               COUNTY  MADISON
AT.-LONG.  454024N 112 044W               SAMPLE LOCATION   2S  3W  7D
TION CODE                                 ANALYSIS NUMBER  79W1272
E SAMPLED  06-28-79                        DRAINAGE BASIN  041G -JEFFERSON
E SAMPLED                                 WATER FLOW RATE     100.  CFS(E)
E SAMPLED                         FLOW MEASUREMENT METHOD
LE SOURCE                         ALTITUDE OF LAND SURFACE
WATER USE                        TOTAL WELL DEPTH BELOW LS
QUIFER(S)                          SWL ABOVE(+) OR BELOW LS
SAMPLED BY  WQBH                 SAMPLE DEPTH BELOW SURFACE

     SAMPLING SITE: SOUTH BOULDER RIVER BELOW MINE ADIT

              MG/L       MEQ/L                             MG/L      MEQ/L
LCIUM  (CA)                         BICARBONATE(HCO3)
ESIUM  (MG)                           CARBONATE (CO3)
ODIUM  (NA)                            CHLORIDE  (CL)
SSIUM   (K)                             SULFATE (SO4)
                                        FLUORIDE    (F)
                                    PHOSPHATE(PO4 AS P)
                                     NO3+NO2 (TOT AS N)

                 ------     ------                    ------     ------
SUM CATIONS       0.0        0.0           SUM ANIONS    0.0        0.000

          LABORATORY PH       7.65     TOT HARDNESS(MG/L-CACO3)
D WATER TEMPERATURE (C)               TOT ALKALINITY(MG/L-CACO3)
 ISS. IONS MEAS.(MG/L)                LABORATORY TURBIDITY (NTU)
 CONDUCTIVITY-UMHOS-25C      85.5        SODIUM ADSORPTION RATIO

             A D D I T I O N A L   P A R A M E T E R S
SENIC,TR (MG/L AS AS)     < .001    CADMIUM, TR (MG/L AS CD)     < .001
OPPER,TR (MG/L AS CU)       .01        LEAD,TR (MG/L AS PB)      < .005
  ZINC,TR (MG/L AS ZN)      .005        IRON,TR (MG/L AS FE)       .09

ARKS: - AMBIENT MONITORING

LANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
 CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
PLE NO             SAMPLER PCG    HANDLING         ANALYST  WRK   LAB  WQBH
PLETED 07-13-79  COMPUTER RUN 08/01/79  DATA 0975/PROC 0876 FUND 6150
O DEV. ION BALANCE  0.00     CA    MG    NA    K    CL   SO4  HCO3  CO3  NO3
RCENT       MPDES           0.0   0.0   0.0  0.0 33.3 33.3   0.0 33.3  0.0
LC. MEQ/L= INSUFFICIENT DATA                                        79W1272
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STATE HEALTH DEPT. WATER QUALITY BUREAU HELENA, MONTANA 59601

STATE	MONTANA	COUNTY	MADISON
LAT.-LONG.	453945N 112 1 3W	SAMPLE LOCATION	2S 3W 18
STATION CODE		ANALYSIS NUMBER	80W0196
DATE SAMPLED	02-20-80	DRAINAGE BASIN	041G -JEFFERSON
TIME SAMPLED		WATER FLOW RATE	
METHOD SAMPLED	GRAB	FLOW MEASUREMENT METHOD	NOT MEASURED
SAMPLE SOURCE	STREAM	ALTITUDE OF LAND SURFACE	
WATER USE	MULTIPLE	TOTAL WELL DEPTH BELOW LS	
AQUIFER(S)		SWL ABOVE(+) OR BELOW LS	
SAMPLED BY	SL	SAMPLE DEPTH BELOW SURFACE	

SAMPLING SITE: SOUTH BOULDER R. ABOVE MAMMOTH

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)			BICARBONATE(HCO3)		
MAGNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
POTASSIUM (K)			SULFATE (SO4)		
			FLUORIDE (F)		
			PHOSPHATE(PO4 AS P)		
			NO3+NO2 (TOT AS N)		
SUM CATIONS	0.0	0.0	SUM ANIONS	0.0	0.000

LABORATORY PH		TOT HARDNESS(MG/L-CACO3)	
FIELD WATER TEMPERATURE (C)		TOT ALKALINITY(MG/L-CACO3)	
SUM-DISS. IONS MEAS.(MG/L)		LABORATORY TURBIDITY (NTU)	
LAB CONDUCTIVITY-UMHOS-25C		SODIUM ADSORPTION RATIO	

ADDITIONAL PARAMETERS

ARSENIC,TR (MG/L AS AS)	< .001	COPPER,TR (MG/L AS CU)	< .01
LEAD,TR (MG/L AS PB)	< .05	ZINC,TR (MG/L AS ZN)	< .005
IRON,TR (MG/L AS FE)	< .01	PH,FIELD(SU)	6.0

REMARKS: ENFORCEMENT

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVILENTS PER LITER
ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
(M)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

- -

SAMPLE NO 2 SAMPLER HANDLING 1100 ANALYST DB LAB WQBH
COMPLETED 03-04-80 COMPUTER RUN 03/20/80 DATA 0975/PROG 0876 FUND 6250

		CA	MG	NA	K	CL	SO4	HCO3	CO3	NO3
STND DEV. ION BALANCE	0.00									
SEGMENT	MPDES	0.0	0.0	0.0	0.0	33.3	33.3	0.0	33.3	0.0

CALC. MEQ/L= INSUFFICIENT DATA 80W0196

Gaffri

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STATE HEALTH DEPT.        WATER QUALITY BUREAU          HELENA, MONTANA  59601

           STATE  MONTANA                                     COUNTY  MADISON
       LAT.-LONG.  453945N 112 1 3W              SAMPLE LOCATION   2S  3W 18
    STATION CODE                                 ANALYSIS NUMBER  80W0197
    DATE SAMPLED  02-20-80                        DRAINAGE BASIN  041G -JEFFERSON
    TIME SAMPLED                                 WATER FLOW RATE
  METHOD SAMPLED  GRAB                  FLOW MEASUREMENT METHOD  NOT MEASURED
   SAMPLE SOURCE  STREAM                ALTITUDE OF LAND SURFACE
       WATER USE  MULTIPLE             TOTAL WELL DEPTH BELOW LS
      AQUIFER(S)                         SWL ABOVE(+) OR BELOW LS
      SAMPLED BY    SL                SAMPLE DEPTH BELOW SURFACE

          SAMPLING SITE: SOUTH BOULDER R. BELOW MAMMOTH

                      MG/L      MEQ/L                                MG/L      MEQ/L
   CALCIUM (CA)                              BICARBONATE(HCO3)
 MAGNESIUM (MG)                                 CARBONATE (CO3)
    SODIUM (NA)                                  CHLORIDE  (CL)
 POTASSIUM  (K)                                   SULFATE (SO4)
                                                 FLUORIDE   (F)
                                           PHOSPHATE(PO4 AS P)
                                            NO3+NO2 (TOT AS N)

                     -------    -------                        -------    -------
    SUM CATIONS       0.0        0.0             SUM ANIONS     0.0        0.000

                LABORATORY PH                 TOT HARDNESS(MG/L-CACO3)
 FIELD WATER TEMPERATURE (C)                 TOT ALKALINITY(MG/L-CACO3)
  SUM-DISS. IONS MEAS.(MG/L)                LABORATORY TURBIDITY (NTU)
  LAB CONDUCTIVITY-UMHOS-25C                  SODIUM ADSORPTION RATIO

                  A D D I T I O N A L   P A R A M E T E R S
    ARSENIC,TR (MG/L AS AS)    < .001     COPPER,TR (MG/L AS CU)     < .01
       LEAD,TR (MG/L AS PB)    < .05        ZINC,TR (MG/L AS ZN)     < .005
       IRON,TR (MG/L AS FE)    < .01                PH,FIELD(SU)      6.0

 REMARKS: ENFORCEMENT

 EXPLANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
 ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
 (M)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 SAMPLE NO 3          SAMPLER              HANDLING 1100    ANALYST    DB    LAB  WQBH
 COMPLETED 03-04-80  COMPUTER RUN 03/20/80  DATA 0975/PROG 0876 FUND 6250
 STND DEV. ION BALANCE  0.00      CA    MG    NA    K    CL   SO4  HCO3  CO3  NO3
 SEGMENT        MPDES             0.0   0.0   0.0   0.0 33.3 33.3   0.0 33.3  0.(
 CALC. MEQ/L= INSUFFICIENT DATA                                            80W0197
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Gaffri

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ATE HEALTH DEPT.        WATER QUALITY BUREAU          HELENA, MONTANA  59601

      STATE  MONTANA                                  COUNTY  MADISON
  LAT.-LONG.  453945N 112 1 3W             SAMPLE LOCATION   2S   3W 18
STATION CODE                               ANALYSIS NUMBER  80W0195
DATE SAMPLED  02-20-80                     DRAINAGE BASIN  041G -JEFFERSON
TIME SAMPLED                               WATER FLOW RATE
THOD SAMPLED  GRAB                 FLOW MEASUREMENT METHOD  NOT MEASURED
AMPLE SOURCE  MINE DRAIN          ALTITUDE OF LAND SURFACE
   WATER USE  UNKNOWN            TOTAL WELL DEPTH BELOW LS
  AQUIFER(S)                     SWL ABOVE(+) OR BELOW LS
  SAMPLED BY    SL               SAMPLE DEPTH BELOW SURFACE

     SAMPLING SITE: MAMMOTH MINE LOWER ADIT

               MG/L      MEQ/L                             MG/L      MEQ/L
CALCIUM  (CA)                       BICARBONATE(HCO3)
GNESIUM  (MG)                         CARBONATE  (CO3)
 SODIUM  (NA)                          CHLORIDE   (CL)
TASSIUM   (K)                           SULFATE  (SO4)
                                       FLUORIDE    (F)
                                 PHOSPHATE(PO4 AS P)
                                  NO3+NO2 (TOT AS N)

               ------    ------                          ------    ------
  SUM CATIONS   0.0       0.0            SUM ANIONS       0.0       0.000

             LABORATORY PH                TOT HARDNESS(MG/L-CACO3)
LD WATER TEMPERATURE (C)               TOT ALKALINITY(MG/L-CACO3)
UM-DISS. IONS MEAS.(MG/L)              LABORATORY TURBIDITY (NTU)
AB CONDUCTIVITY-UMHOS-25C                SODIUM ADSORPTION RATIO

                A D D I T I O N A L   P A R A M E T E R S
 ARSENIC,TR (MG/L AS AS)       .010     COPPER,TR (MG/L AS CU)       .05
    LEAD,TR (MG/L AS PB)     < .05        ZINC,TR (MG/L AS ZN)     < .005
    IRON,TR (MG/L AS FE)       .50
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PH Field 6.0

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EMARKS: ENFORCEMENT

XPLANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
LL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
M)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
MPLE NO 1          SAMPLER            HANDLING 1100   ANALYST   DB   LAB  WQBH
MPLETED 03-04-80  COMPUTER RUN 03/20/80  DATA 0975/PROG 0876 FUND 6250
TND DEV. ION BALANCE  0.00      CA    MG    NA     K    CL   SO4   HCO3   CO3   NO3
EGMENT       MPDES             0.0   0.0   0.0   0.0  33.3  33.3   0.0   33.3   0.0
ALC. MEQ/L= INSUFFICIENT DATA                                                80W0195
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TE HEALTH DEPT.         WATER QUALITY BUREAU           HELENA, MONTANA  59601

    STATE  MONTANA                                    COUNTY  MADISON
 LAT.-LONG.  454037N 112 1 3W              SAMPLE LOCATION   2S  3W  7
TATION CODE                                ANALYSIS NUMBER  80W0592
ATE SAMPLED  04-23-80                       DRAINAGE BASIN  0416 -JEFFERSON
IME SAMPLED                                WATER FLOW RATE      10.00GPM(M)
HOD SAMPLED  GRAB                   FLOW MEASUREMENT METHOD
MPLE SOURCE  MINE DRAIN            ALTITUDE OF LAND SURFACE
  WATER USE                       TOTAL WELL DEPTH BELOW LS
 AQUIFER(S)                        SWL ABOVE(+) OR BELOW LS
 SAMPLED BY   DSL                SAMPLE DEPTH BELOW SURFACE

    SAMPLING SITE: MAMMOTH MINE OPENING

                MG/L      MEQ/L                                MG/L      MEQ/L
ALCIUM (CA)                         BICARBONATE(HCO3)
NESIUM (MG)                           CARBONATE (CO3)
SODIUM (NA)                            CHLORIDE   (CL)
ASSIUM  (K)                             SULFATE (SO4)
                                       FLUORIDE    (F)
                                  PHOSPHATE(PO4 AS P)
                                   NO3+NO2 (TOT AS N)

                ------    ------                              ------    ------
 SUM CATIONS     0.0       0.0              SUM ANIONS        0.0       0.000

         LABORATORY PH                    TOT HARDNESS(MG/L-CACO3)
LD WATER TEMPERATURE (C)                 TOT ALKALINITY(MG/L-CACO3)
M-DISS. IONS MEAS.(MG/L)                 LABORATORY TURBIDITY (NTU)
B CONDUCTIVITY-UMHOS-25C                  SODIUM ADSORPTION RATIO

                ADDITIONAL  PARAMETERS
DMIUM, TR (MG/L AS CD)   < .005    COPPER,TR (MG/L AS CU)          .14
  IRON,TR (MG/L AS FE)    1.48     MANGANESE,TR(MG/L AS MN)        .28
UMINUM,TR (MG/L AS AL)     .10
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pH 6 field

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ARKS:  ABANDONED MINE LANDS      MINE DISCHARGE  VISUAL FLOW ESTIMATE

PLANATION: MG/L=MILLIGRAMS PER LITER   MEQ/L=MILLIEQUIVILENTS PER LITER
 CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
PLE NO 2          SAMPLER  MGC     HANDLING 1100    ANALYST   DB   LAB  WQBH
PLETED 05-12-80  COMPUTER RUN 05/16/80  DATA 0975/PROG 0876 FUND 5501
D DEV. ION BALANCE  0.00      CA    MG    NA     K    CL   SO4  HCO3  CO3  NO3
GMENT       NPDES            0.0   0.0   0.0   0.0  33.3  33.3  0.0  33.3  0.0
LC. MEQ/L= INSUFFICIENT DATA                                         80W0592
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ATE HEALTH DEPT. WATER QUALITY BUREAU HELENA, MONTANA 59601

STATE	MONTANA	COUNTY	MADISON
LAT.-LONG.	454037N 112 1 3W	SAMPLE LOCATION	2S 3W 7
STATION CODE		ANALYSIS NUMBER	80W0595
DATE SAMPLED	04-23-80	DRAINAGE BASIN	0416 -JEFFERSON
TIME SAMPLED		WATER FLOW RATE	15.00GPM(M)
THOD SAMPLED	GRAB	FLOW MEASUREMENT METHOD	
AMPLE SOURCE	MINE DRAIN	ALTITUDE OF LAND SURFACE	
WATER USE		TOTAL WELL DEPTH BELOW LS	
AQUIFER(S)		SWL ABOVE(+) OR BELOW LS	
SAMPLED BY	DSL	SAMPLE DEPTH BELOW SURFACE	

SAMPLING SITE: BELOW MAMMOTH TAILINGS AT CATTLE GUARD

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)			BICARBONATE(HCO3)		
GNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
TASSIUM (K)			SULFATE (SO4)		
			FLUORIDE (F)		
			PHOSPHATE(PO4 AS P)		
			NO3+NO2 (TOT AS N)		
SUM CATIONS	0.0	0.0	SUM ANIONS	0.0	0.000

LABORATORY PH		TOT HARDNESS(MG/L-CACO3)	
D WATER TEMPERATURE (C)		TOT ALKALINITY(MG/L-CACO3)	
-DISS. IONS MEAS.(MG/L)		LABORATORY TURBIDITY (NTU)	
AB CONDUCTIVITY-UMHOS-25C		SODIUM ADSORPTION RATIO	

ADDITIONAL PARAMETERS

ADMIUM, TR (MG/L AS CD)	< .005	COPPER,TR (MG/L AS CU)	3.18
IRON,TR (MG/L AS FE)	299.	MANGANESE,TR(MG/L AS MN)	5.36
LUMINUM,TR (MG/L AS AL)	10.53		

pH 6 - field

MARKS: ABANDONED MINE LANDS MINE DISCHARGE VISUAL FLOW ESTIMATE

PLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVILENTS PER LITER
L CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

MPLE NO 5 SAMPLER MGC HANDLING 1100 ANALYST DB LAB WQBH
LETED 05-12-80 COMPUTER RUN 05/16/80 DATA 0975/PROG 0876 FUND 5501

		CA	MG	NA	K	CL	SO4	HCO3	CO3	NO3
D DEV. ION BALANCE	0.00									
GMENT	MPDES	0.0	0.0	0.0	0.0	33.3	33.3	0.0	33.3	0.0

LC. MEQ/L= INSUFFICIENT DATA 80W0595

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 HEALTH DEPT.        WATER QUALITY BUREAU         HELENA, MONTANA  59601

    STATE  MONTANA                                      COUNTY  MADISON
AT.-LONG.  454037N 112 1 3W              SAMPLE LOCATION   2S  3W   7
TION CODE                                ANALYSIS NUMBER   80W0591
E SAMPLED  04-23-80                       DRAINAGE BASIN   041G -JEFFERSON
E SAMPLED                                WATER FLOW RATE
D SAMPLED  GRAB                 FLOW MEASUREMENT METHOD   NOT MEASURED
LE SOURCE  STREAM              ALTITUDE OF LAND SURFACE
WATER USE  MULTIPLE           TOTAL WELL DEPTH BELOW LS
AQUIFER(S)                     SWL ABOVE(+) OR BELOW LS
SAMPLED BY   DSL             SAMPLE DEPTH BELOW SURFACE

    SAMPLING SITE: SOUTH BOULDER ABOVE TAILING DISCHARGE

                MG/L      MEQ/L                              MG/L      MEQ/L
LCIUM (CA)                          BICARBONATE(HCO3)
SIUM (MG)                             CARBONATE (CO3)
ODIUM (NA)                             CHLORIDE   (CL)
SSIUM  (K)                              SULFATE (SO4)
                                       FLUORIDE    (F)
                                PHOSPHATE(PO4 AS P)
                                 NO3+NO2 (TOT AS N)

               ______    ______                         ______    ______
SUM CATIONS     0.0       0.0              SUM ANIONS    0.0      0.000

           LABORATORY PH                TOT HARDNESS(MG/L-CACO3)
D WATER TEMPERATURE (C)               TOT ALKALINITY(MG/L-CACO3)
-DISS. IONS MEAS.(MG/L)               LABORATORY TURBIDITY (NTU)
 CONDUCTIVITY-UMHOS-25C                  SODIUM ADSORPTION RATIO

              ADDITIONAL  PARAMETERS
MIUM, TR (MG/L AS CD)    < .005    COPPER,TR (MG/L AS CU)     < .01
  IRON,TR (MG/L AS FE)     .03   MANGANESE,TR(MG/L AS MN)     < .005
MINUM,TR (MG/L AS AL)      .10
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pH 6 field

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RKS:  ABANDONED MINE LANDS

LANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
 CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
PLE NO 1          SAMPLER  MGC     HANDLING 1100    ANALYST   DB   LAB  WQBH
PLETED 05-12-80  COMPUTER RUN 05/16/80  DATA 0975/PROG 0876 FUND 5501
D DEV. ION BALANCE  0.00        CA    MG    NA    K   CL  SO4  HCO3  CO3  NO3
MENT       MPDES               0.0   0.0   0.0  0.0 33.3 33.3  0.0 33.3  0.0
C. MEQ/L= INSUFFICIENT DATA                                         80W0591
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TE HEALTH DEPT. WATER QUALITY BUREAU HELENA, MONTANA 59601

STATE	MONTANA	COUNTY	MADISON
LAT.-LONG.	454037N 11156 9W	SAMPLE LOCATION	2S 3W 11
TATION CODE		ANALYSIS NUMBER	80W0596
ATE SAMPLED	04-23-80	DRAINAGE BASIN	041G -JEFFERSON
IME SAMPLED		WATER FLOW RATE	
HOD SAMPLED	GRAB	FLOW MEASUREMENT METHOD	NOT MEASURED
MPLE SOURCE	STREAM	ALTITUDE OF LAND SURFACE	
WATER USE	MULTIPLE	TOTAL WELL DEPTH BELOW LS	
AQUIFER(S)		SWL ABOVE(+) OR BELOW LS	
SAMPLED BY	DSL	SAMPLE DEPTH BELOW SURFACE	

SAMPLING SITE: SOUTH BOULDER RIVER AT BRIDGE

	MG/L	MEQ/L		MG/L	MEQ/L
ALCIUM (CA)			BICARBONATE(HCO3)		
NESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
TASSIUM (K)			SULFATE (SO4)		
			FLUORIDE (F)		
			PHOSPHATE(PO4 AS P)		
			NO3+NO2 (TOT AS N)		
SUM CATIONS	0.0	0.0	SUM ANIONS	0.0	0.000

LABORATORY PH		TOT HARDNESS(MG/L-CACO3)	
D WATER TEMPERATURE (C)		TOT ALKALINITY(MG/L-CACO3)	
-DISS. IONS MEAS.(MG/L)		LABORATORY TURBIDITY (NTU)	
AB CONDUCTIVITY-UMHOS-25C		SODIUM ADSORPTION RATIO	

ADDITIONAL PARAMETERS

ADMIUM, TR (MG/L AS CD)	< .005	COPPER,TR (MG/L AS CU)	.01
IRON,TR (MG/L AS FE)	1.65	MANGANESE,TR(MG/L AS MN)	.03
LUMINUM,TR (MG/L AS AL)	.10		

pH 6 field

MARKS: ABANDONED MINE LANDS

PLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVILENTS PER LITER
L CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

- -

MPLE NO 6 SAMPLER MGC HANDLING 1100 ANALYST DS LAB WQBH
PLETED 05-12-80 COMPUTER RUN 05/16/80 DATA 0975/PROG 0876 FUND 5501

		CA	MG	NA	K	CL	SO4	HCO3	CO3	NO3
D DEV. ION BALANCE	0.00									
GMENT	MPDES	0.0	0.0	0.0	0.0	33.3	33.3	0.0	33.3	0.0

LC. MEQ/L= INSUFFICIENT DATA 80W0596

ATE HEALTH DEPT.   WATER QUALITY BUREAU   HELENA, MONTANA 59601

STATE	MONTANA	COUNTY	MADISON
LAT.-LONG.	453945N 112 1 3W	SAMPLE LOCATION	2S 3W 18
STATION CODE		ANALYSIS NUMBER	80W0594
DATE SAMPLED	04-23-80	DRAINAGE BASIN	041G -JEFFERSON
TIME SAMPLED		WATER FLOW RATE	
THOD SAMPLED	GRAB	FLOW MEASUREMENT METHOD	NOT MEASURED
MPLE SOURCE	STREAM	ALTITUDE OF LAND SURFACE	
WATER USE	MULTIPLE	TOTAL WELL DEPTH BELOW LS	
AQUIFER(S)		SWL ABOVE(+) OR BELOW LS	
SAMPLED BY	DSL	SAMPLE DEPTH BELOW SURFACE	

SAMPLING SITE: SOUTH BOULDER ABOVE PARK CREEK

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)			BICARBONATE(HCO3)		
GNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
TASSIUM (K)			SULFATE (SO4)		
			FLUORIDE (F)		
			PHOSPHATE(PO4 AS P)		
			NO3+NO2 (TOT AS N)		
SUM CATIONS	0.0	0.0	SUM ANIONS	0.0	0.000

LABORATORY PH		TOT HARDNESS(MG/L-CACO3)	
ELD WATER TEMPERATURE (C)		TOT ALKALINITY(MG/L-CACO3)	
UM-DISS. IONS MEAS.(MG/L)		LABORATORY TURBIDITY (NTU)	
AB CONDUCTIVITY-UMHOS-25C		SODIUM ADSORPTION RATIO	

ADDITIONAL PARAMETERS

ADMIUM, TR (MG/L AS CD)	< .005	COPPER, TR (MG/L AS CU)	< .01
IRON, TR (MG/L AS FE)	.03	MANGANESE, TR(MG/L AS MN)	< .005
LUMINUM, TR (MG/L AS AL)	< 0.10		

pH 6 field

MARKS: ABANDONED MINE LANDS

PLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVILENTS PER LITER
L CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

MPLE NO 4   SAMPLER MGC   HANDLING 1100   ANALYST DB   LAB WQBH
MPLETED 05-12-80   COMPUTER RUN 05/16/80   DATA 0975/PROG 0876 FUND 5501

		CA	MG	NA	K	CL	SO4	HCO3	CO3	NO3
ND DEV. ION BALANCE 0.00										
GMENT	MPDES	0.0	0.0	0.0	0.0	33.3	33.3	0.0	33.3	0.0

LC. MEQ/L= INSUFFICIENT DATA

80W0594

ATE HEALTH DEPT. WATER QUALITY BUREAU HELENA, MONTANA 59601

STATE	MONTANA	COUNTY	MADISON
LAT.-LONG.	453945N 112 1 3W	SAMPLE LOCATION	2S 3W 18
STATION CODE		ANALYSIS NUMBER	80W0593
DATE SAMPLED	04-23-80	DRAINAGE BASIN	041G -JEFFERSON
TIME SAMPLED		WATER FLOW RATE	15.00GPM(M)
THOD SAMPLED	GRAB	FLOW MEASUREMENT METHOD	
AMPLE SOURCE	STREAM	ALTITUDE OF LAND SURFACE	
WATER USE		TOTAL WELL DEPTH BELOW LS	
AQUIFER(S)		SWL ABOVE(+) OR BELOW LS	
SAMPLED BY	DSL	SAMPLE DEPTH BELOW SURFACE	

SAMPLING SITE: INTERMITTANT STREAM IN MAMMOTH

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)			BICARBONATE(HCO3)		
GNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
TASSIUM (K)			SULFATE (SO4)		
			FLUORIDE (F)		
			PHOSPHATE(PO4 AS P)		
			NO3+NO2 (TOT AS N)		
SUM CATIONS	0.0	0.0	SUM ANIONS	0.0	0.000

LABORATORY PH		TOT HARDNESS(MG/L-CACO3)	
O WATER TEMPERATURE (C)		TOT ALKALINITY(MG/L-CACO3)	
-DISS. IONS MEAS.(MG/L)		LABORATORY TURBIDITY (NTU)	
AB CONDUCTIVITY-UMHOS-25C		SODIUM ADSORPTION RATIO	

ADDITIONAL PARAMETERS

ADMIUM, TR (MG/L AS CD)	< .005	COPPER,TR (MG/L AS CU)	.05
IRON,TR (MG/L AS FE)	3.40	MANGANESE,TR(MG/L AS MN)	.15
LUMINUM,TR (MG/L AS AL)	.83		

pH 6 - field

MARKS: ABANDONED MINE LANDS RUNOFF STREAM VISUAL FLOW ESTIMATE

PLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVILENTS PER LITER
L CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

- -

MPLE NO 3 SAMPLER MGC HANDLING 1100 ANALYST DB LAB WQBH
LETED 05-12-80 COMPUTER RUN 05/16/80 DATA 0975/PROG 0876 FUND 5501

DEV. ION BALANCE 0.00	CA	MG	NA	K	CL	SO4	HCO3	CO3	NO3
GMENT MPDES	0.0	0.0	0.0	0.0	33.3	33.3	0.0	33.3	0.0

LC. MEQ/L= INSUFFICIENT DATA 80W0593

29-008, #3: Adit discharge at level I; SW-3 sample location

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: MAMMOTH TAILINGS PA#: 29-082

Date: July 19, 1993 Time: 0930

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: Belanger, Pioneer
Clark, Pioneer

Visitors: None

Weather/Seasonality Observations: Sunny in morning; rain in afternoon; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #28: WR-1, adit (gate), chemical shed; #29: Flowing adit (HMO) portal #5; #30: TP-1, SW; #31: West; #32: NW; #33: North; (#30-#33: TP-1 panorama from above); #34: TP-2 from TP-1 top; #35: North end of TP-1 from below; #36: West side of TP-1; #37: North end of TP-1, highwall (TP-1 below); #38: West side, erosion gully. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): Adit #1 (Portal #5) is an HMO with excessive discharge. Flow is diverted around the main part of the tailings, to the south of them, though it flows through old, stream flumed tailings in that dry drainage.

Other Hazardous Materials/Substances Present: There were barrels of sodium sulfide, sodium hypochlorite, sodium cyanide (empty), caustic soda (NaOH) and bags of lime located in the chemical building. Shed was locked, but accessible.

General Comments on Potential Remedial Alternatives: Close adit; route discharge around tailings. Doze/smooth tailings, cover, and revegetate (add rock); relocate some to lower pond (TP-2). Remove chemicals.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): MAMMOTH TAILINGS PA#: 29-082

Legal Description: T 2S ;R 3W ;Sec. 7,18 , ___1/4___1/4___1/4

County: MADISON Mining District: SOUTH BOULDER

Latitude: N 45° 40' 14" Longitude: W 112° 00' 48"

Primary Drainage Basin and Code: Jefferson River/10020005
Secondary Drainage Basin: South Boulder River

USGS Quadrangle map name(s): Manhead Mountain

Mine Type/Commodities: Hardrock/Gold, Silver, Copper

Activity Status: Active___,Inactive/Exploration X ,Abandoned___.

Ownership status: Known Y X N__; private/public? Private/Public
Owner, Agent, or Contact(Include address and phone when available): Edison and Lucille Workman, P.O. Box 4, Cardwell, MT 59721. (406) 287-5784; Deerlodge National Forest.

Relationship to other mines/sites in the area/district: Located below the Mammoth mine.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? Hardrock permit for reprocessing tailings; possible ground water discharge permit.

General site features: Elevation 6000' , Slope Flat, 10° ,
Aspect West-northwest

Land use: Mining X , Recreational X , Residential X , Urban___,
Agricultural___, Other(Specify)

Area of disturbed/unvegetated lands? 15.2 acres.
Dimensions: 1,000 feet x 600 feet

Predominant vegetation types: Douglas fir, aspen, cottonwood, willows

Access: roads - good X ,poor___,4wd___,trail___.
Other logistical considerations (proximity to other sites). North of the town of Mammoth.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 16 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site lies on the east side of the Boulder River. An unnamed tributary flows from east to west into and across the site into the South Boulder River, which flows north away from the site. Site lies in a mineralized zone in the Mammoth Fault between the Pony Gneiss and Cherry Creek Gneiss.

Mining/milling history, ore type/tenor, host rock, gangue: From 1901 to 1961, records from Mammoth mine and the adjacent Leviathan mine show production as 78,750 oz. Au, 159,600 oz. Ag, and 1.54 million lbs. of Cu. Host rock is gneiss; ore fracture filling along the Mammoth Fault Zone.

Mine Operation?

Shafts -	Yes___,	No X ,	# ____,	Comment
Adits -	Yes X ,	No___,	# 1 ,	Comment HMO; discharge
Pits -	Yes___,	No X ,	# ____,	Comment
Placers -	Yes___,	No X ,	# ____,	Comment
Other -	Yes X ,	No___,	# 1 ,	Comment Highwalls on tailings

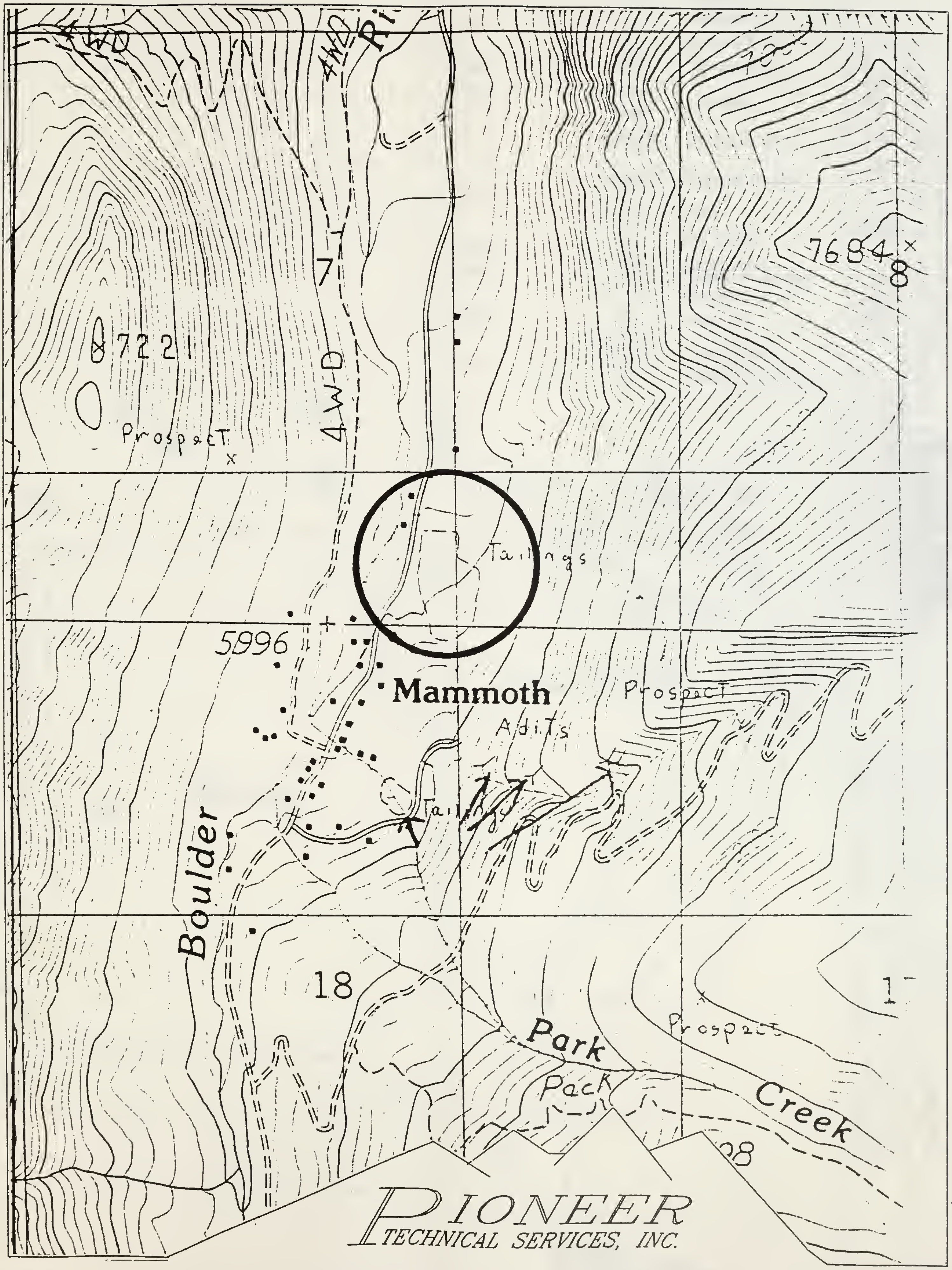
Mill Operation? Yes X , No____. If yes answer the next three questions:

Period(s) of Operation: Unknown

Origin of Ore Milled - Custom Mill___ Dedicated Mill X ; Number and names of mines that supplied mill feed: Local area and reprocessing tailings.

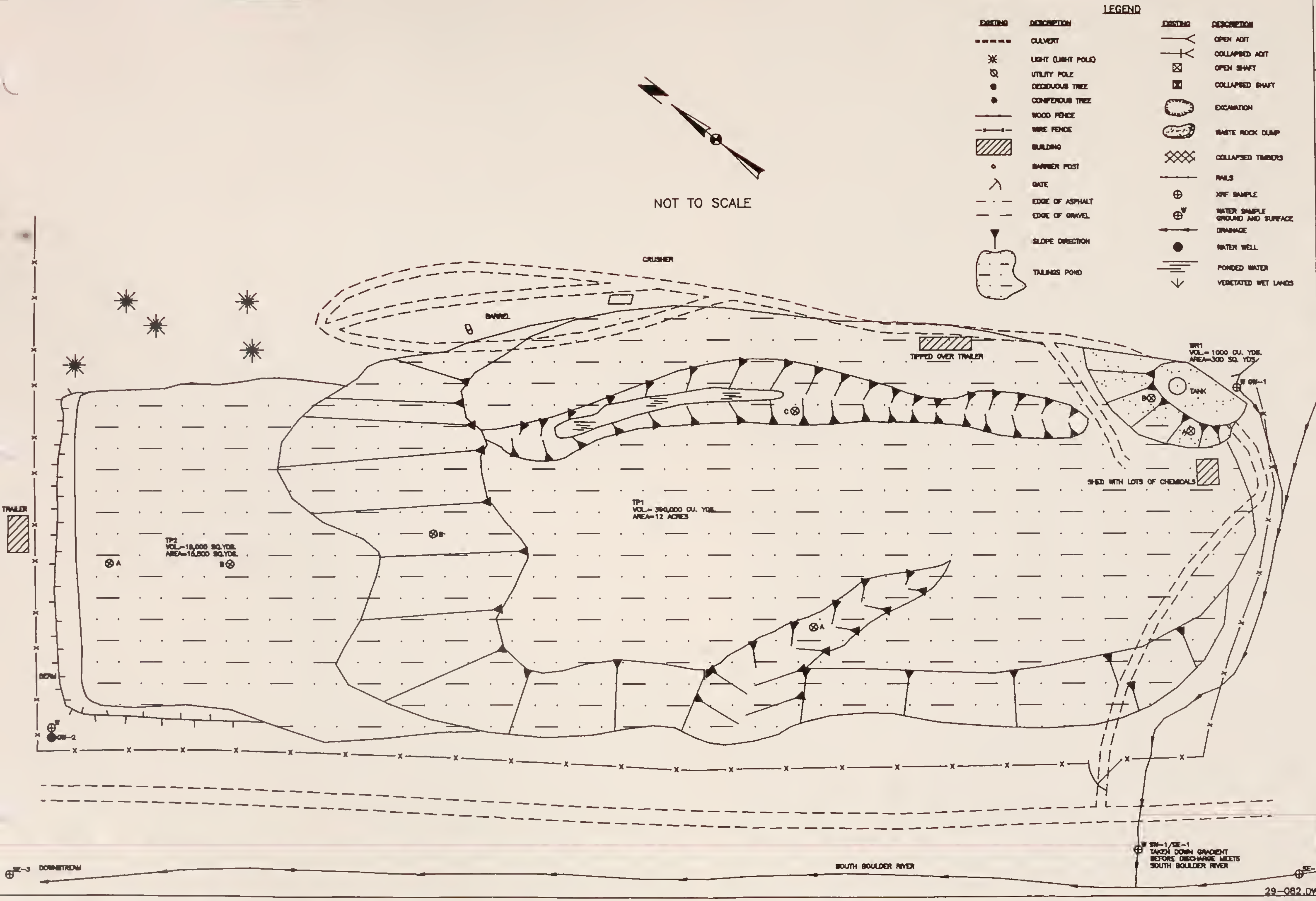
Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting?
CN- leach, heap; floatation

Well No.	Location	Depth	Yield	Static Water Level
M:107318	02S 03W 07 DB	95.0	8.0	60.00
M:125638	02S 03W 07 DD	70.0	15.0	46.00
M:107321	02S 03W 18	150.0	4.0	20.00
M:127913	02S 03W 18	60.0	20.0	15.00
M:107320	02S 03W 18	202.0	8.0	20.00
M:107319	02S 03W 18	50.0	25.0	21.00
M:107322	02S 03W 18 ADD	35.0	0.0	0.00
M:107323	02S 03W 18 B	81.0	17.0	18.00
M:107324	02S 03W 18 BA	160.0	20.0	40.00
M:128046	02S 03W 18 BA	110.0	20.0	30.00
M:107325	02S 03W 18 BAA	19.0	10.0	9.00
M:107326	02S 03W 18 BAA	0.0	10.0	0.00
M:107327	02S 03W 18 BB	260.0	30.0	52.00
M:107328	02S 03W 18 BBB	0.0	7.0	130.00
M:125639	02S 03W 18 BDB	47.0	15.0	13.00
M:107329	02S 03W 21 CBC	81.0	0.0	59.00



MAMMOTH TAILINGS, P.A. NO. 29-082

T02S, R03W, SECTION 07
SCALE: 1" = 1000'



MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

MAMMOTH TAILINGS PA# 29-082
SOUTH BOULDER DISTRICT MADISON COUNTY

PIONEER TECHNICAL SERVICES, INC. BUTTE, MT.

DRAWN JTP DATE 20 OCT 93
DESIGNED TPR JOB NO. 93-17
APPROVED WJB F.B. NO.

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS–BOZEMAN–KALISPELL MONTANA
SPOKANE WASHINGTON

SHEET NO.

29-082.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): Primarily sands and silts, some clay layers.

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): 40' thick on the north side.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Dry

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): No containment on TP-1; berms for TP-2.

Comments on potential for mitigation: Smooth out, add rocks, and nutrients.

SOURCE INVENTORY FORM

SAMPLERS: Tuesday, Belanger*

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd³)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	1,000	SW corner of WR-1	None	4.8 (D)	0.05	29-082-WR-1	07/19/93 1530	T-Metals, ABA
WR-1B	WR		Northeast corner of WR-1	None	NM	NM			
TP-1A-1	TAIL	390,000	W side of TP-1, W side of Gully profile; 0'-6', red/brown silt	None	3.6 (D)	0.06	29-082-TP-1	07/19/93 1700	T-Metals, ABA, CN-
TP-1A-2	TAIL		W side of TP-1, W side of Gully profile; 6'-8', white/tan sand	None	5.6 (D)	0.04			
TP-1A-3	TAIL		W side of TP-1, W side of Gully profile; 8'-15', tan/orange sand	None	4.4 (D)	0.04			
TP-1A-4	TAIL		W side of TP-1, W side of Gully profile; 15'-15.5', dark gray clay	None	4.2 (D)	0.05	29-082-TP-2	07/19/93 1530	T-Metals, ABA, CN-
TP-1A-5	TAIL		W side of TP-1, W side of Gully profile; 15.5'-25.5', multi-color sand	None	4.4 (D)	0.04			
TP-1B-1	TAIL		NW face of TP-1, profile; 0'-6', orange/tan silt	None	5.9 (D)	0.05			
TP-1B-2	TAIL		NW face of TP-1, profile; 8'-15', orange sand	None	5.8 (D)	0.05			
TP-1B-3	TAIL		NW face of TP-1, profile; 20'-32', orange/red sand	None	< 3.5 (D)	0.04			
TP-1B-4	TAIL		NW face of TP-1, profile; 32'-33', black clay	None	< 3.5 (D)	0.04			
TP-1B-5	TAIL		NW face of TP-1, profile; 33'-37', orange silt/sand	None	< 3.5 (D)	0.05			
TP-1C-1	TAIL		East side of TP-1, west side of, profile; 0'-9', orange silt	None	3.8 (D)	0.04			
TP-1C-2	TAIL		East side of TP-1, west side of, profile; 9'-15', tan/orange sand	None	< 3.5 (D)	0.05			
TP-1C-3	TAIL		East side of TP-1, west side of, profile; 15'-15.5', light gray clay	None	5.6 (D)	0.05			

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 29-082-TP-1 is composite of TP-1A-1 through 1A-3, TP-1B-1 through 1B-3, and TP-1C-1 through 1C-3. 29-082-TP-2 is composite of TP-1A-4 and 1A-5, and TP-1B-4 and 1B-5. 29-082-WR-1 is composite of WR-1A and -1B. NM = Not Measured

*Continued on next page

SOURCE INVENTORY FORM (Cont'd)

SAMPLERS: Tuesday, Belanger

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
TP-2A-1	TAIL	15,500	NW center of TP-2, profile; 0-6", orange sand	Berms/Fair	6.6 (D)	0.04	29-082-TP-3	07/19/93 1630	T-Metals, ABA, CN
TP-2A-2	TAIL		NW center of TP-2, profile; 6"-12", brown sand	Berms/Fair	6.0 (D)	0.05			
TP-2A-3	TAIL		NW center of TP-2, profile; 12"-36", orange sand	Berms/Fair	4.6 (D)	0.04			
TP-2B-1	TAIL		SW center of TP-2, profile; 0'-1', orange sand	Berms/Fair	3.8 (D)	0.05			
TP-2B-2	TAIL		SW center of TP-2, profile; 1'-2.25', brown clay	Berms/Fair	< 3.5 (D)	0.05			

*D-Direct reading(Kelvey Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 29-082-TP-3 is composite of TP-2A-1 through -2A-3, and TP-2B-1 and -2B-2.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X , No___, Number: 1 Identification: Adit #1 or Portal #5

Filled shafts: Yes___, No X , Number:____ Identification:____

Seeps/Springs: Yes___, No X , Number:____ Identification:____

Groundwater wells within 4 miles?: Yes X , No___;
Number of well logs: 18

Distance to nearest well used for drinking? 120 feet

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable X , Possible____, Unlikely____.
Groundwater at 45' bgs; large uncontained source.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: Tuesday, Belanger

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
GW-1	AD	Flowing adit	0.87 cfs (M)	7.31	250	274.7	7.7	19	N/A	29-082-GW-1	07/19/93 1130	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
GW-2	MW	Monitor well, northwest corner	N/A	7.29	320	95.2	6.8	40	SWL=43.42	29-082-GW-2	07/19/93 1830	D-Metals, TDS, Hardness, Cl, SO4, NO2/NO3, CN

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________________

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No ___, Name(s): Unnamed tributary from east ends up joining adit discharge; South Boulder River is west of the site.

Dry streambeds: Yes ___, No X, Name(s): ___

Other surface water: Yes X, No ___, Name(s)/Description: Discharge from adit and pooled water on tailings.

Waste materials within any floodplain: Yes X, No ___ Source ID(s): Tailings pond lies in flooplain of South Boulder River.

Approximate Flood frequency? ___ 1 yr, ___ 10 yr, X 100 yr

Estimated seasonal flow of stream(s) (cfs)? Unnamed tributary, 1.6 cfs during investigation
High Flow: 0.5 cfs upgradient; 8.0 downgradient,
Average Flow: 0 upgradient (dry); 1.6 cfs downgradient

Distance between waste source(s) and nearest surface water body (ft)? 0 feet to unnamed tributary.

Surface water draining onto or through waste sources: Yes ___, No X, Describe: Adit discharge is currently routed around the tailings.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Fishery, irrigation, wetlands, recreation

Observed erosional/sedimentation/stream turbidity problems? Yes X, No ___, Distance downstream (ft)? N/A Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Erosion of tailings pile is obvious but not to surface water body; old tailings along bank of South Boulder River from old milling.

SURFACE WATER INVENTORY FORM

SAMPLERS: Belanger

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	At PPE of adit discharge and South Boulder River in tributary to South Boulder River	7.88	290	239.6	8.5	20	1.6 cfs (M)	29-082-SW-1	07/19/93 1100	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	At PPE of adit discharge and South Boulder River in tributary to South Boulder River	N/A	N/A	N/A	N/A	N/A	N/A	29-082-SE-1	07/19/93 1100	T-Metals
SE-2	SE	Upgradient of site, downgradient of Mammoth Mine in South Boulder River	N/A	N/A	N/A	N/A	N/A	N/A	29-008-SE-2	07/19/93 1550	T-Metals
SE-3	SE	Downgradient in South Boulder River of site	N/A	N/A	N/A	N/A	N/A	N/A	29-082-SE-3	07/19/93 1545	T-Metals

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): Upgradient sediment sample is from Mammoth mine downgradient sample.

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 5 acres

Wetlands present: Yes___, No X , Describe:

Carbonate rocks/soils: Yes___, No X , Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30___; 30-100 X ; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence(ft or miles)? 50 feet south

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Tuesday, Belanger

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
WR-1	Sulfides; FEOX	Dry	2,700	2,700	Yes	Low
TP-1	FEOX; Low pH	Dry	522,720	522,720	Yes	High
TP-2	FEOX; Low pH	Partial	139,500	139,500	Yes	Moderate

Notes and Clarifications: Residents spoke of dust release problem; anecdotal evidence.

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes X, No ___, Describe: TP-1 is 50 feet north of residence.

Population within 1 mile: 1-10 ___; 10-30 ___; 30-100 X; 100-300 ___; 300-1,000 ___; 1,000-3,000 ___; 3,000-10,000 ___; 10,000 or greater ___; Comments ___

Evidence of recreational use on site: Yes X, No ___, Describe: Beer cans, 4-wheeler tracks

Accessibility - Fences, warning signs, closed roads? Fenced and signed; no locks.

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes ___, No X, Comment ___
Wilderness Area - Yes ___, No X, Comment ___
T&E Species Habitat - Yes ___, No X, Comment ___
Bat Habitat - Yes ___, No X, Comment ___

Primary Drainage ___; Secondary Drainage X; No Information ___:

Riparian Habitat Quality - High ___, Medium ___, Low X
Wetlands Frontage - High ___, Medium ___, Low X
Fisheries Habitat and Species Classification - 4
Sport Fishery Classification - 3

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No ___, Number 1, types and locations: Flowing adit (Portal #5)

Hazardous structures: Yes ___, No X, Number ___, types and locations: Chemical building in good condition, but presence of chemicals is hazardous.

Unstable highwalls, pits, trenches, slopes: Yes X, No ___, Number 1, types and locations: Highwall is located where tailings were dug for reprocessing.

Unstable waste piles, impoundments, undercut banks: Yes ___, No X, Number ___, types and locations: ___

Fire and/or Explosion hazards: Yes ___, No X, Explain: ___

Bibliography

MBMG, Analytical Data for Mammoth Tailings, Provided by Ted Duaime, Date Unknown.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for the Mammoth mine, Prepared by Northern Engineering and Testing, April 28, 1987.

MDSL/AMRB Files, Memorandum To Ben Mundie, Regarding the Mammoth Mine Site Visit, Project No. 87-3001-I, From Roger Braun, Northern Engineering and Testing, May 1, 1987.

MDSL/AMRB Files, Problem Area Data Form for the Mammoth Tailings, Prepared by Mark Carlstrom, February 20, 1980.

MDSL/AMRB Files, United States Department of the Interior (Bureau of Mines), Summary Report, Mineral Investigation of the Middle Mountain-Tobacco Root, Rare II Area (No. B1013), Madison County, Montana, Written by Eric E. Cather and J. Mitchell Linne, 1983.

USGS, Topographic Map, Manhead Mountain, Montana, 7 1/2 minute Quadrangle, 1989.

LABORATORY ANALYTICAL DATA

MAMMOTH TAILINGS
PA NO. 29-082

Mammoth Tailings PA# 29-082
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 07/19/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-082-SE-1	898 J	114 J	2.2	101 JX	24.8 JX	1010 J	55900 J	0.388	2930 J	49 J	35	7 UJ	275 J	NR
29-008-SE-2	7 U	31.3	1.8 J	12.4	28	64.4	10300	0.287	377	33	16	8 U	107	NR
29-082-SE-3	103 J	131 J	1.7	19.6 JX	39.2 JX	285 J	27200 J	0.594	723 J	39 J	33	8 UJ	214 J	NR
29-082-TP-1	289 J	224 J	0.7	9.8 JX	7.4 JX	434 J	38300 J	0.368	530 J	11 J	22	7 UJ	94 J	0.279 U
29-082-TP-2	651 J	263 J	1.9	32.2 JX	5.2 JX	1160 J	43200 J	0.398	441 J	26 J	23	6 UJ	224 J	0.308 U
29-082-TP-3	515 J	143 J	1.1	6.6 JX	4.2 JX	648 J	28000 J	0.276	173 J	9 J	105	7 UJ	106 J	0.292 U
29-082-WR-1	244 J	137 J	0.9	5.6 JX	3.9 JX	63.7 J	23000 J	1.2	223 J	9 J	19	5 UJ	74 J	NR
BACKGROUND	28	174	1.5 J	11	24.3	28.6	15900	0.219	1000	18	23	6 U	47 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
29-082-TP-1	1.91	59.7	-5	-65	0.91	0.85	0.15	26.6	-31.5
29-082-TP-2	0.4	12.5	16	3.52	0.15	0.2	0.05	6.25	9.77
29-082-TP-3	0.08	2.5	22.7	20.2	<0.01	0.16	0.06	5	17.7
29-082-WR-1	0.31	9.68	11.7	1.97	0.22	0.04	0.05	1.25	10.4

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-082-GW-1	24.5	19	2.83 J	9.9	6.83 U	306	2710	0.038 U	347	19.3	2.27	30.7 U	136	86.3
29-082-GW-2	1.79	31.5	2.57 U	9.7 U	6.83 U	1.55 U	1640	0.038 U	205	13.3	1.83	30.7 U	17.9	127
29-082-SW-1	26.5	18.8	4.77 J	9.7 U	6.83 U	305	2740	0.039	333	16.4	1.85	30.7 U	129	83.1

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-082-GW-1	140	6.3	74	0.17	NR
29-082-GW-2	196	5.8	95	< 0.05	< 0.01
29-082-SW-1	153	5.3	75	0.11	NR

LEGEND

SE1 - At PPE of adit discharge and S. Boulder River, in the tributary.
SE2 - Upgradient sediment sample in the S. Boulder River.
SE3 - Downgradient of site on S. Boulder River.
TP1 - Composite of subsamples TP1A-1 through 1A-3, 1B-1 through 1B-3, 1C-1 through 1C-3.
TP3 - Composite of subsamples TP2A-1 through 2A-3, 2B-1, and 2B-2.
WR1 - Sample of the WR1A subsample.
BACKGROUND - From the Mammoth Mine (29-008-SS-1).
GW1 - Flowing adit.
GW2 - Monitor well, Northwest corner.
SW1 - Same as sample SE1.

XRF ANALYSIS RESULTS

MAMMOTH TAILINGS
PA NO. 29-082

Mine Name: Mammoth Tailings PA# 29-082
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
29-082-TP1A-1		41180.2	4106.36	1719.62		626.952 *	22499.4		88.0157 *	63.1423 *	84.761 *	69.3487
29-082-TP1A-2		41045.1	4618.78	2071.33		482.83 *	22629.2		85.6371 *	64.2569 *	42.5717 *	71.2878
29-082-TP1A-3		41486.5	4043.39	2375.67		862.307 *	32725.8		115.244 *	54.2669 *	167.818	86.6351
29-082-TP1A-4		48620.7	3867.35	2470.8		885.842 *	32366.5		155.312 *	170.295	409.149	71.6085
29-082-TP1A-5		23452.4	2382.44	1280.76		392.745 *	28084.3		337.979	64.2571 *	507.686	39.6033
29-082-TP1B-1		32148.3	3019.79	1801		571.953 *	23000.4		290.859	97.5953 *	336.123	54.1287
29-082-TP1B-2		24262.3	3152.88	2426.51		535.018 *	33919.8		366.595	161.022	708.495	37.5985
29-082-TP1B-3		28281.6	2477.65	1487.92			31340.5		361.344	64.0881 *	560.202	43.5574
29-082-TP1B-4		20350.3	2531.3	1223.55	179.151 *		54528.5	425.305 *	1849.5	178.888	1389.21	35.0953
29-082-TP1B-5		16577.3	1788.45	1089.52		313.544 *	34828.9		936.377	261.186	632.734	25.6527
29-082-TP1C-1		35111	3890.96	2076.43		630.294 *	33026.7		372.134	52.8257 *	138.253	83.4122
29-082-TP1C-2		36359.1	4707.13	1927.86		890.297 *	31738.1		401.439	80.4893 *	400.263	62.3684
29-082-TP1C-3		46389.7	7066.88	3306.81		795.167 *	41360.8	323.78 *	200.637 *		145.542	76.2714
29-082-TP2A-1		22415.9	1984.11	1334.73			18217		405.481	58.2513 *	322.536	46.3549
29-082-TP2A-2		26812.4	2436.59	1275.62		717.406 *	18432.4		256.707	96.4114 *	173.485	60.9749
29-082-TP2A-3		22183.5	2012.05	1360.91	142.415 *		17905		377.125	48.4097 *	363.036	46.5922
29-082-TP2B-1		22743.8	1931.38	1453.8			20071.4		341.834	64.0662 *	534.647	48.5652
29-082-TP2B-2		37981.3	2454.77	2376.91		378.953 *	51871.6	341.114 *	546.466	126.682 *	803.366	63.9126
29-082-TP-1-COMP		31722.8	3973.31	2161.74		623.297 *	31695.4		277.617	78.8481 *	325.258	61.5675
29-082-TP-2-COMP		35262.2	3637.68	2069.64		612.695 *	41807.1	300.612 *	995.386	182.544	734.207	49.1614
29-082-TP-3-COMP		24830.8	2398.56	1713.12		353.196 *	23990.4		443.724	88.6077 *	454.613	51.9259
29-082-WR1-A		16339.6	2189.35	1016.59			32106.4			49.3228 *	568.331	68.7647
29-082-WR1-B		25688.2	17679.2	3290.43		909.463 *	38122.2		109.514 *	165.708	128.623	111.462
29-082-WR-1-COMP		25732.2	13711	2837.48		733.601 *	34778.8		79.1001 *	136.802	280.39	97.9415

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
29-082-TP1A-1	289.627				166.405		61.8472 *	959.139	86.4735 *	20.0115 *	20.5506 *
29-082-TP1A-2	356.064				175.118			967.547		22.1965 *	24.5599
29-082-TP1A-3	456.084				170.177			1192.4		23.7748 *	24.0353
29-082-TP1A-4	350.953	39.9319 *			206.627			1195.09		20.3365 *	29.8592
29-082-TP1A-5	180.731	39.7497 *		16.8875 *	99.9586			699.04		12.9102 *	16.7265 *
29-082-TP1B-1	306.911	38.6295 *			129.872			933.871	85.4516 *	26.6061 *	21.4278
29-082-TP1B-2	318.566	31.4768 *	8.06068 *	25.3373 *	120.822			705.271		20.093 *	19.8247 *
29-082-TP1B-3	196.951	37.0335 *	4.911 *	25.2211 *	127.936			895.5		16.0324 *	9.5758 *
29-082-TP1B-4	130.821	36.7297 *		42.4507 *	94.2365			575.457		9.32449 *	20.724
29-082-TP1B-5	160.791			29.6584 *	82.4549			547.448			19.8423
29-082-TP1C-1	222.834				131.486			858.785		11.9901 *	17.2731 *
29-082-TP1C-2	271.42	34.7887 *			161.905			867.989	107.595 *	14.1586 *	23.8041
29-082-TP1C-3	290.635				190.017			741.579		21.2273 *	29.0366
29-082-TP2A-1	162.006	29.5793 *			104.016			694.929		13.6279 *	19.1299 *
29-082-TP2A-2	150.35	31.5827 *			125.095			803.491		12.8319 *	18.8036 *
29-082-TP2A-3	150.579		4.13193 *		101.086			646.851		12.3917 *	13.7445 *
29-082-TP2B-1	220.999			35.0568 *	108.212			752.142		11.8868 *	16.91 *
29-082-TP2B-2	234.167			52.8827 *	160.741			885.388		10.1352 *	23.6877
29-082-TP-1-COMP	282.934	35.7546 *		22.8757 *	149.683			1037.87		18.9522 *	19.2862 *
29-082-TP-2-COMP	236.043	48.6307 *		27.599 *	131.94			1040.53		18.8294 *	23.376
29-082-TP-3-COMP	179.952		5.87075 *	40.8571 *	125.219			879.858		12.2843 *	22.1578
29-082-WR1-A	177.458	39.0389 *		22.9345 *	94.7111			796.827		11.1046 *	9.38917 *
29-082-WR1-B	529.442				144.576			1243.62		21.4384 *	22.4612
29-082-WR-1-COMP	274.843			26.1847 *	144.814			1128.01		15.2423 *	22.2603

* - Estimated Quantity
$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

MAMMOTH TAILINGS
PA NO. 29-082

AIMSS SCORESHEET

SITE NAME: MAMMOTH TAILINGS
PA NUMBER: 29-082

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		10
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	200
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	200
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	121.328
6	GW - TARGETS	WELLS - 1 MI. x 2.5		40.0
7		WELLS - 1 TO 4 MI		2
8		NEAREST WELL		10
9		TARGETS SCORE	LINES 6 + 7 + 8	52.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	1261811
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		50
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	750
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	130.270
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	18
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	1758645
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		200
26A		CONTAINMENT		20
26B		DISTANCE TO POPULATION		20
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	400
27		LIKELIHOOD SCORE	LINES 25 + 26C	600
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.889
29	AIR - TARGETS	POPULATION - 4 MILES		30
30		NEAREST RESIDENCE		10
31		WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	40
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	21336
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		250
37A		ACCESSIBILITY		10
37B		DISTANCE TO POPULATION		20
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	200
38		LIKELIHOOD SCORE	LINES 36 + 37C	450
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.835
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		30
41		NEAREST RESIDENCE		10
42		RECREATIONAL USE		5
43		TARGETS SCORE	SUM LINES 40 THRU 42	45
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	16909
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000			**30.59**

SITE NAME: MAMMOTH TAILINGS
PA NUMBER: 29-082

LINE NO.		SITE SAFETY		
1	THREAT	ACCESSIBILITY		10
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	75
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		100
8		HAZARDS SCORE	SUM LINES 2 THRU 7	225
9		POPULATION - 1 MILE		30
10	TARGETS	NEAREST RESIDENCE		10
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 THRU 11	45
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**101.25**

SUMMARY OF HISTORICAL ANALYTICAL DATA FROM OTHER SOURCES

LAB ID	SAMPLE ID	Cr	Crc	Crq	Ni	Nic	Niq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
92Q637	CUSRB20	0.00	U		0.00	U		1.74	B		7.25	B		0.00	U		0.00	U	
92Q638	CUSS10L	0.00	U		0.00	U		3.54	B		25.03	B		10.57	B		0.00	U	
92Q639	CUSS20L	0.00	U		11.59	B		3546.00			6824.00			6.52	B		0.00	U	
92Q640	CUSS30L	0.00	U		3.23	B		90.62			2756.00			1.63	B		0.00	U	
92Q641	CUSS40L	0.63	U		0.00	U		10.09	B		59.64			4.90	B		0.00	U	
92Q642	CUSS50L	0.00	U		0.00	U		38.08	B		498.42			4.76	B		0.00	U	
92Q643	CUSS60L	0.00	U		0.00	U		38.09	B		511.40			3.88	B		0.00	U	

TOTAL RECOVERABLE METALS: (ppb)

LAB ID	SAMPLE ID	Cr	Crc	Crq	Ni	Nic	Niq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
92Q958	CUSS30L	0.00	U		4.91	B		451.54			3523.00			63.79			0.00	U	
92Q959	CUSS40L	0.00	U		0.00	U		7.79	B		49.38			3.68	B		0.00	U	
92Q960	CUSS50L	0.00	U		0.00	U		72.74			520.38			12.70	B		0.00	U	
92Q961	CUSS60L	0.00	U		0.00	U		71.35			1175.00			12.61	B		0.00	U	

MORNING GLORY

Site visited, but no sample results available.

CHAMPION MINE

DISSOLVED METALS: (ppb)

LAB ID	SAMPLE ID	Cr	Crc	Crq	Ni	Nic	Niq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
92Q819	DCHS10M	0.00	U		9.05	B		0.00	U		0.00	U		0.82	B		0.00	U	

MAMMOTH TAILINGS

DISSOLVED METALS: (ppb)

LAB ID	SAMPLE ID	Cr	Crc	Crq	Ni	Nic	Niq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
92Q1482	JBSTRIP	-1.76	U		-1.18	U		-0.74	U		1.91	U		-0.88	U		-1.14	U	
92Q1514	JBSB10L	-1.12	U		0.13	U		1.56	U		63.63			-0.55	U		-1.14	U	

TOTAL RECOVERABLE METALS: (ppb)

LAB ID	SAMPLE ID	Cr	Crc	Crq	Ni	Nic	Niq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
92Q1515	JBSB10L	0.00	U		0.00	U		0.00	U		0.00	U		0.00	U		0.00	U	
92Q1515	JBSB10L	0.00	U		0.00	U		0.00	U		5.65	B		1.55	B		0.00	U	

NONPAREIL MINE

LAB ID	SAMPLE ID	Cd	Cdc	Cdq	Ba	Bac	Baq	Pb	Pbc	Pbq	Hg	Hgc	Hgq
92Q637	CUSRB20	0.63	B		6.69	B		0.00	U				
92Q638	CUSS10L	0.67	B		17.38	B		1.29	B				
92Q639	CUSS20L	242.32			23.08	B		89.75					
92Q640	CUSS30L	44.57			27.83	B		1.47	B				
92Q641	CUSS40L	0.91	B		27.32	B		0.96	B				
92Q642	CUSS50L	7.09	B		28.35	B		1.40	B				
92Q643	CUSS60L	7.44	B		23.05	B		1.34	B				
TOTAL RECOVERABLE METALS: (ppb)													
92Q958	CUSS30L	46.23			31.74	B		11.26					
92Q959	CUSS40L	0.00	U		21.40	B		0.00	U				
92Q960	CUSS50L	5.91	B		21.73	B		0.90	B		0.37		
92Q961	CUSS60L	5.90	B		23.95	B		1.00	B				

MORNING GLORY

Site visited, but no sample

CHAMPION MINE

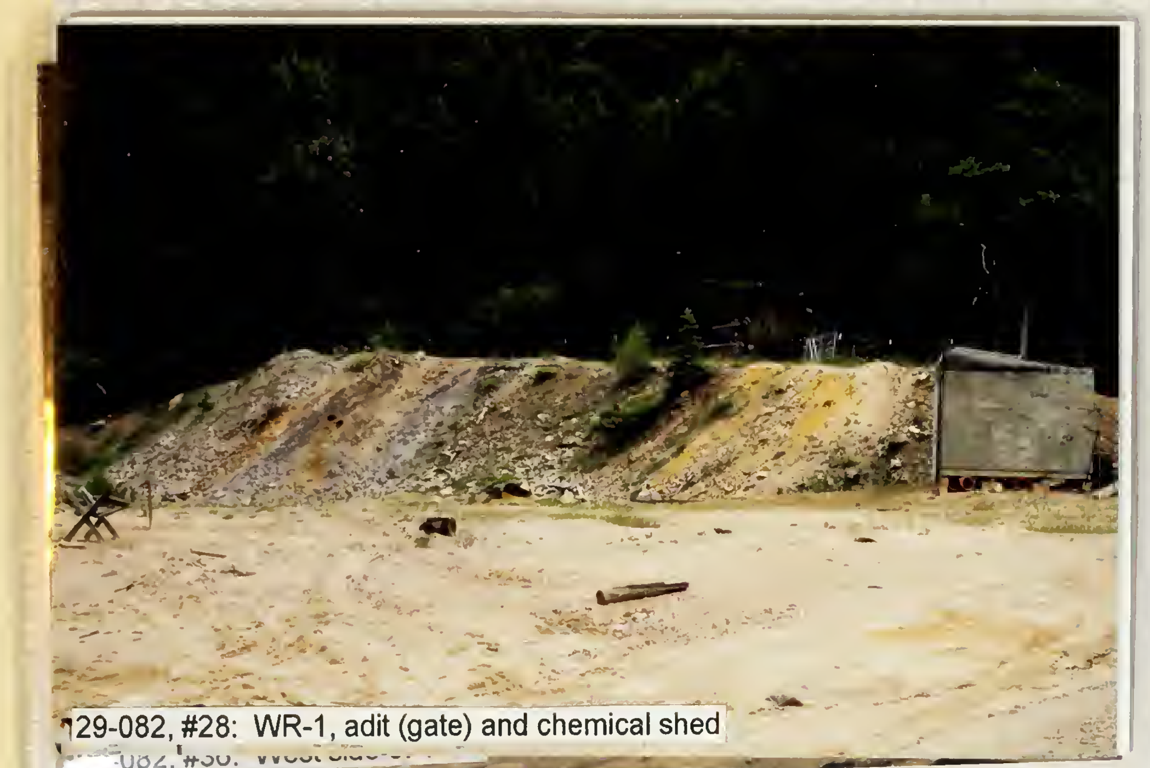
DISSOLVED METALS: (ppb)

92Q819	DCHS10M	0.88	B		19.74	B		0.00	U				

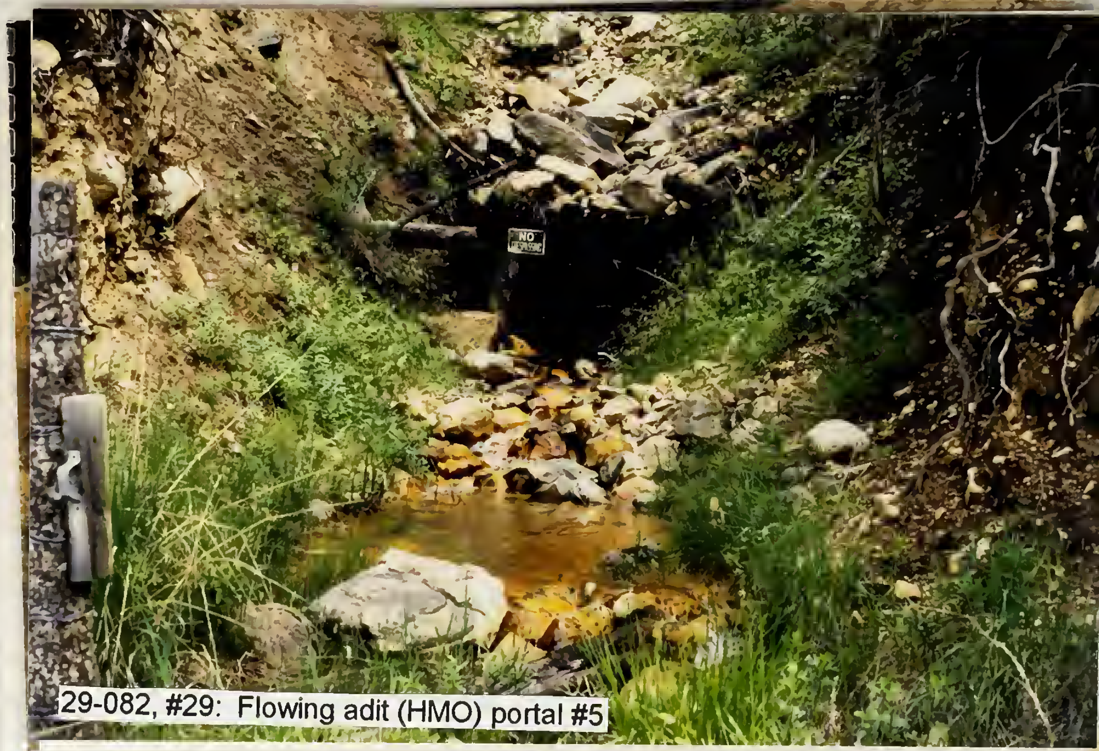
MAMMOTH TAILINGS

DISSOLVED METALS: (ppb)													
92Q1482	JBSTRIP	-0.92	U		-1.52	U		-1.16	U				
92Q1514	JBSB10L	0.59	U		16.21	B		-0.63	U				
TOTAL RECOVERABLE METALS: (ppb)													
92Q1515	JBSB10L	0.00	U		17.10	B		0.00	U		0.07	B	
92Q1515	JBSB10L	0.00	U		14.93	B		0.00	U		0.07	B	

NONPAREIL MINE



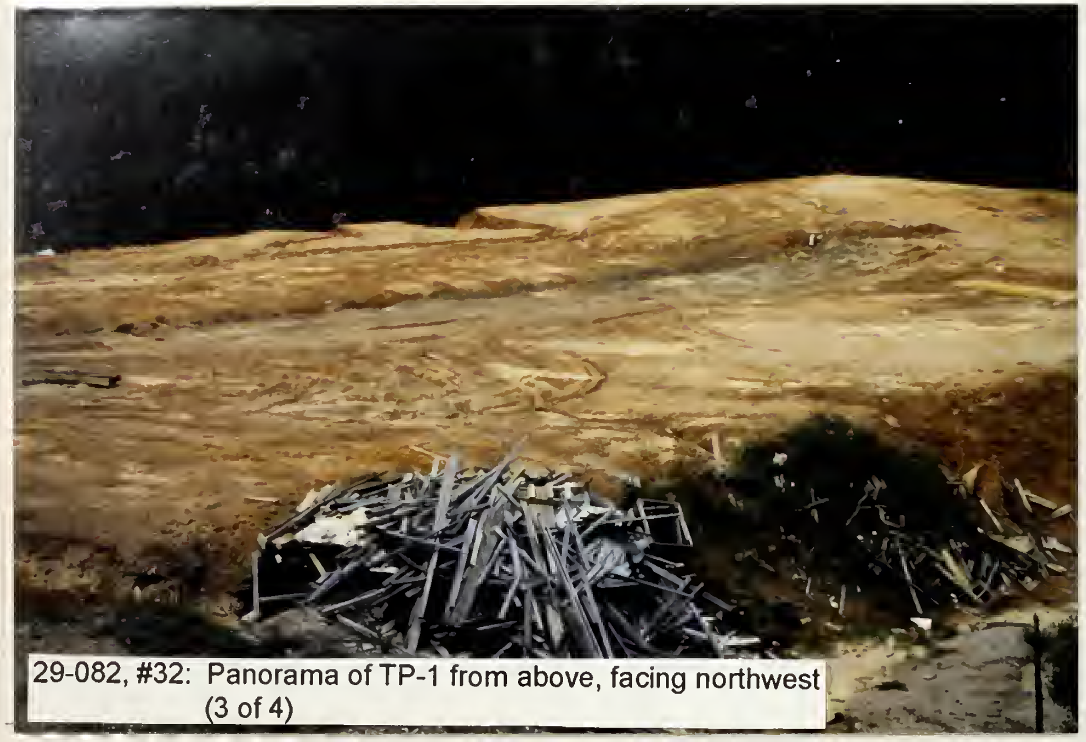
29-082, #28: WR-1, adit (gate) and chemical shed



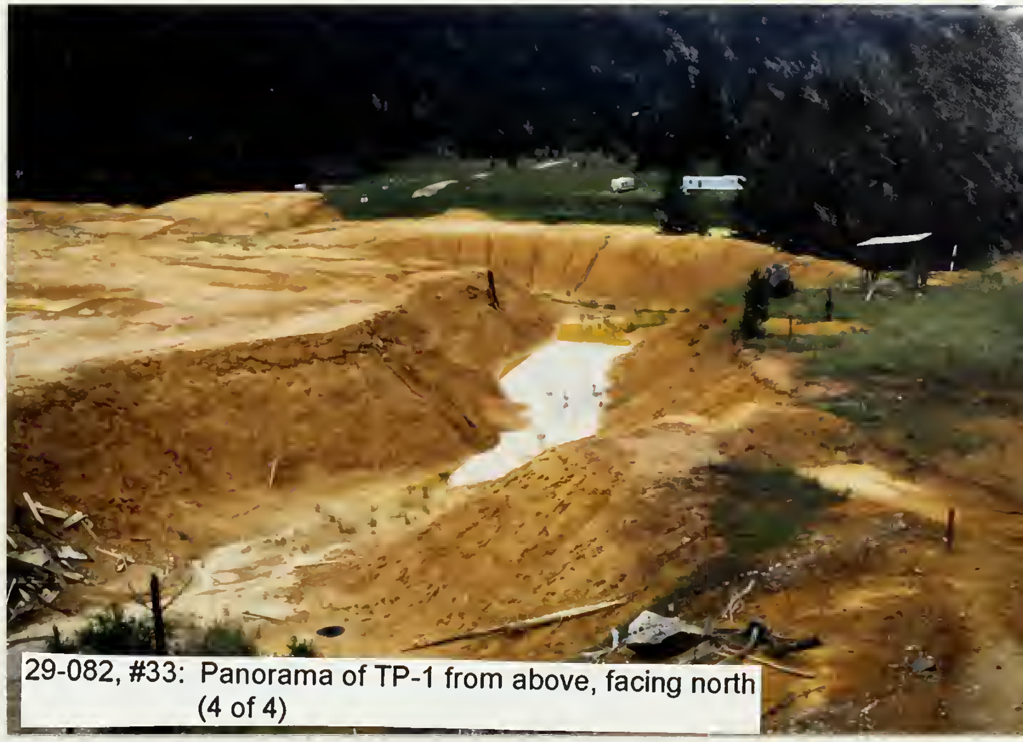
29-082, #29: Flowing adit (HMO) portal #5

29-082, #30: Panorama of TP-1 from above, facing southwest (1 of 4)

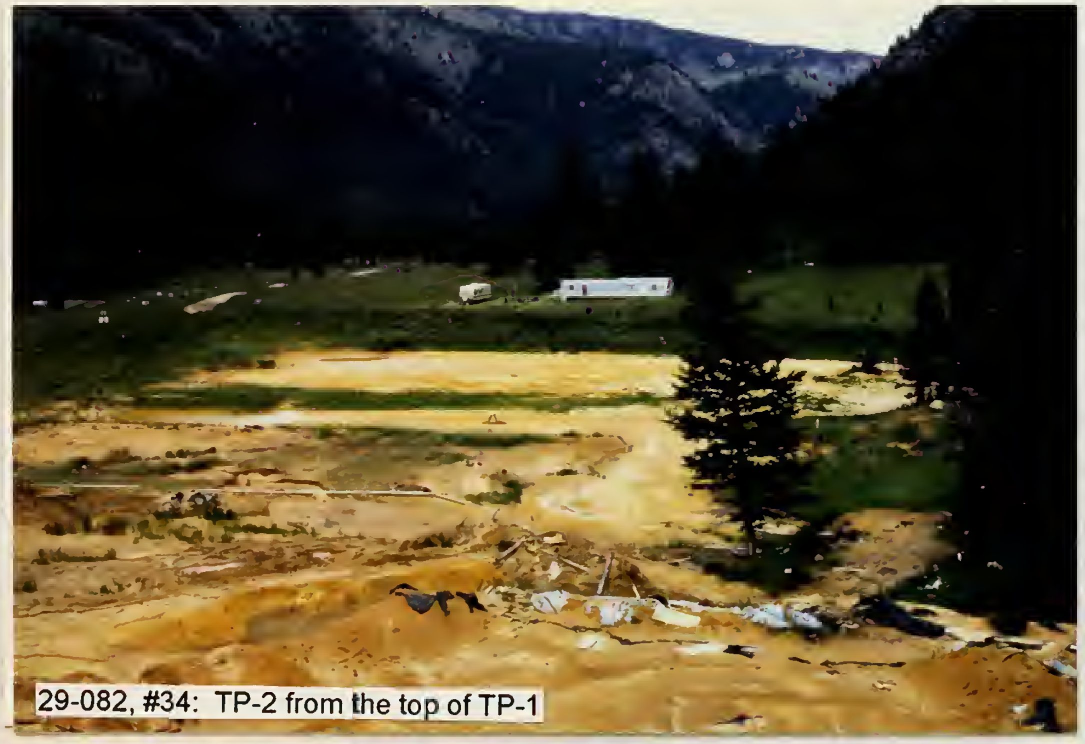
29-082, #31: Panorama of TP-1 from above, facing west (2 of 4)



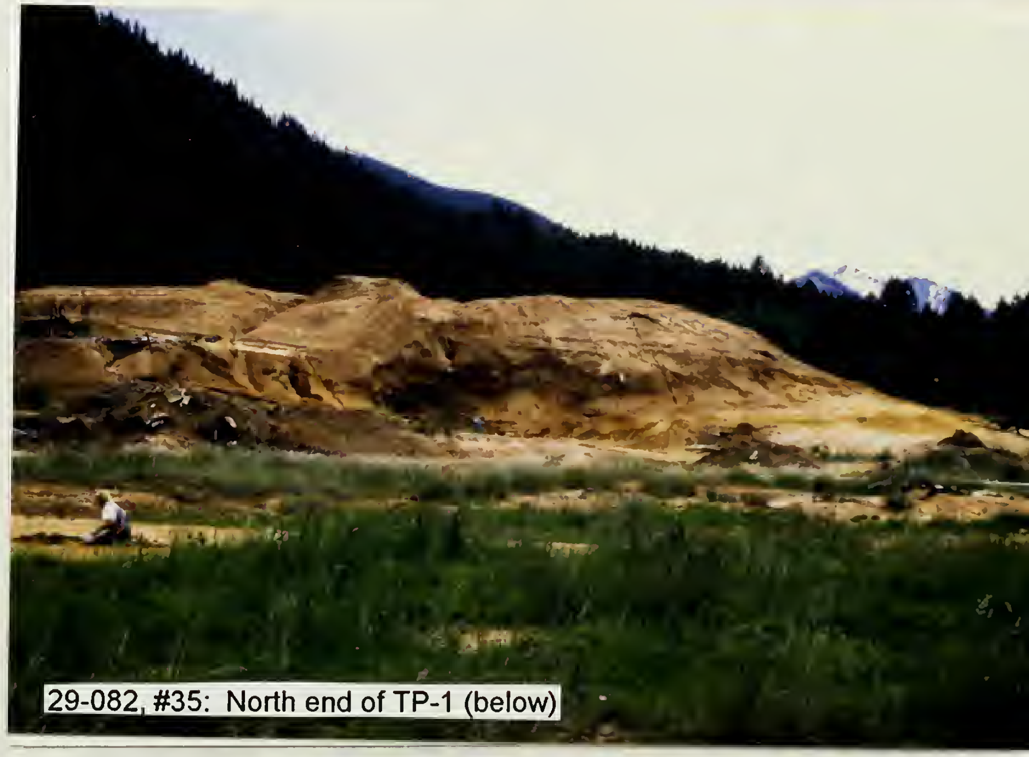
29-082, #32: Panorama of TP-1 from above, facing northwest (3 of 4)



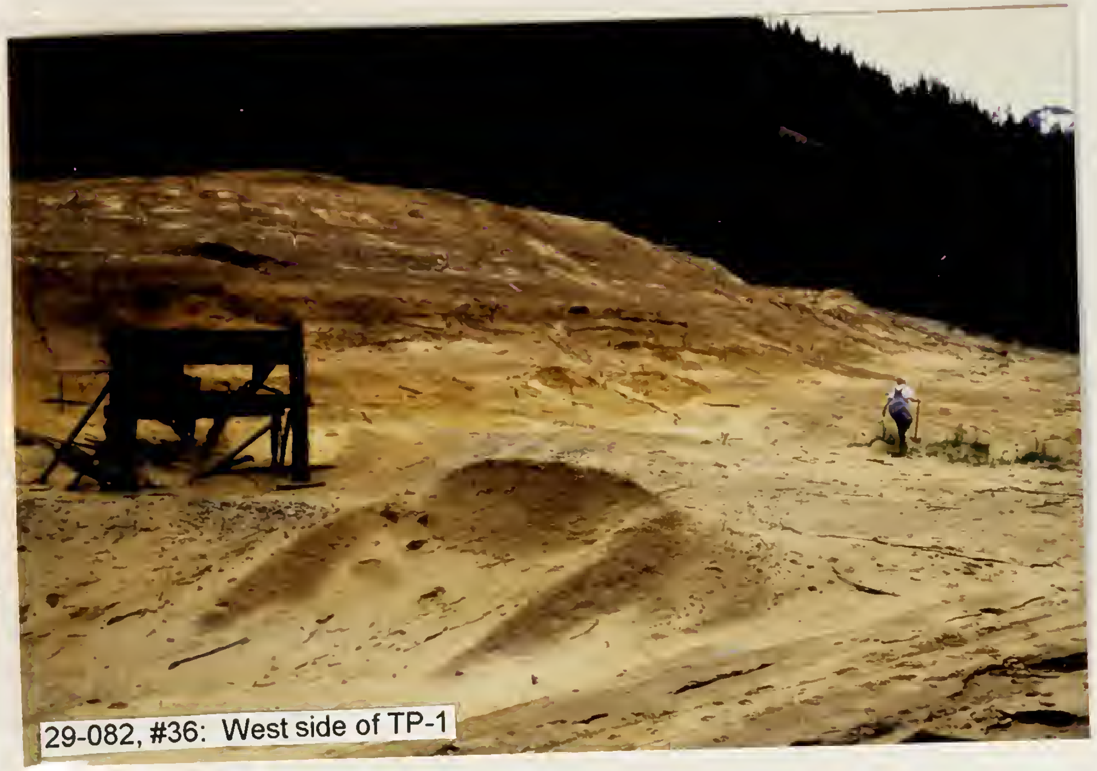
29-082, #33: Panorama of TP-1 from above, facing north (4 of 4)



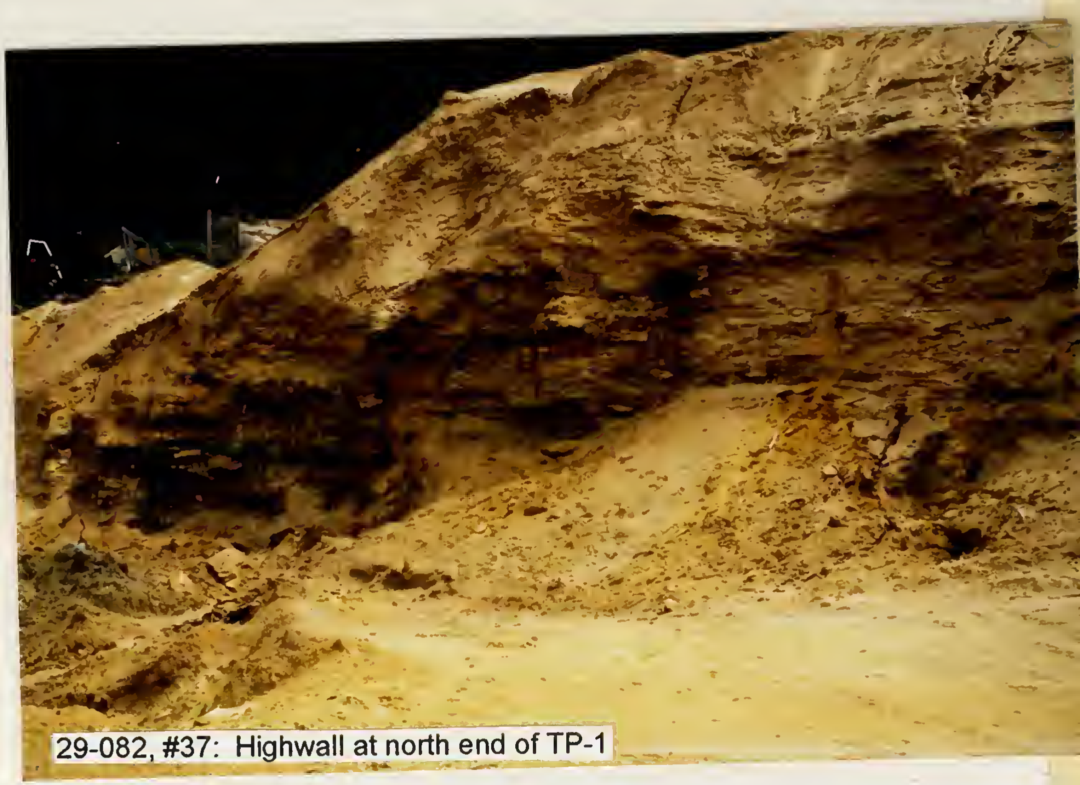
29-082, #34: TP-2 from the top of TP-1



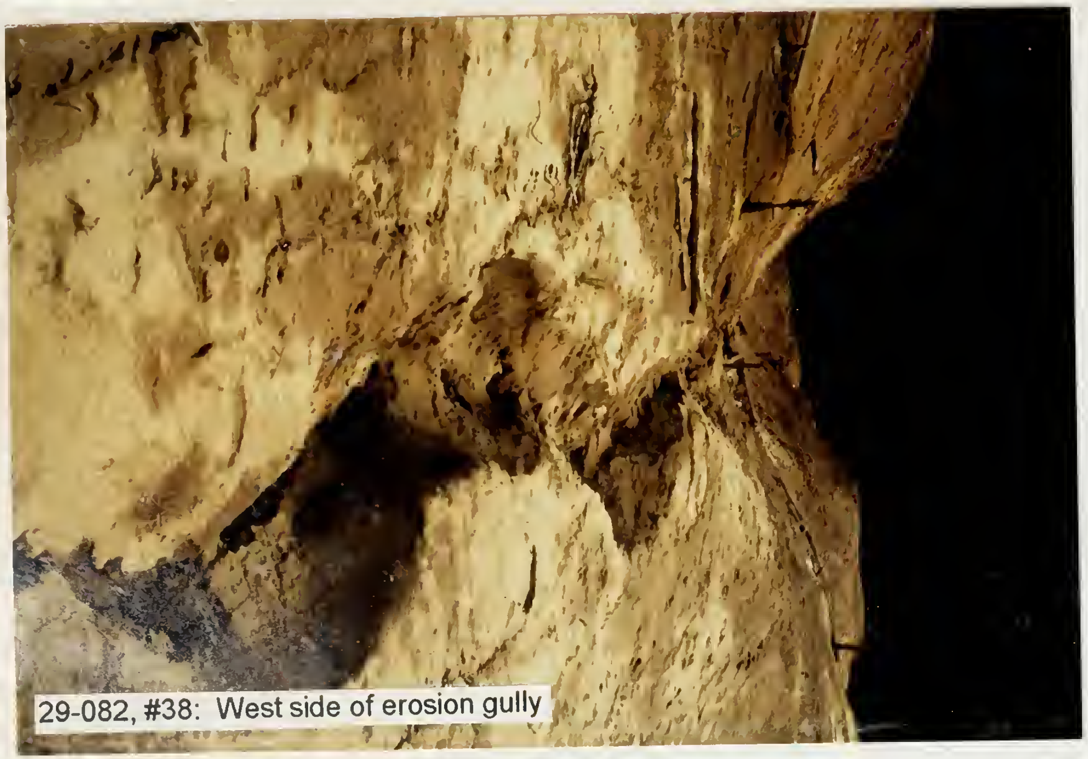
29-082, #35: North end of TP-1 (below)



29-082, #36: West side of TP-1



29-082, #37: Highwall at north end of TP-1



29-082, #38: West side of erosion gully

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: B & H PA#: 29-083

Date: July 23, 1993 Time: 0830

Field Team Leader: Babits, Pioneer

Sampling Personnel: Lasher, Pioneer
Pierson, TD&H

Visitors: Forester

Weather/Seasonality Observations: Partly cloudy; cool (50°F); slight breeze (5 mph); cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #14: WR-1, loadout, and unnamed tributary of Bear Gulch. No video taken.

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Possible to revegetate waste or some recovery of metals. Adit discharge is near neutral with Maximum Contaminant Levels exceeded.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): B & H PA#: 29-083

Legal Description: T 3S ;R 4W ;Sec. 7 , NE1/4 NE1/4 ___1/4

County: MADISON Mining District: TIDAL WAVE

Latitude: N 45° 35' 40" Longitude: W 112° 07' 45"

Primary Drainage Basin and Code: Currant Creek/10020005
Secondary Drainage Basin: Bear Gulch

USGS Quadrangle map name(s): Old Baldy Mountain

Mine Type/Commodities: Hardrock/Gold, Silver, Lead, Copper

Activity Status: Active___,Inactive/Exploration X ,Abandoned___.

Ownership status: Known YX N__; private/public? Private/Public
Owner, Agent, or Contact(Include address and phone when available): Mooseleaf Co., 108 Burlingame, Syracuse, NY 13203; Deerlodge National Forest.

Relationship to other mines/sites in the area/district: Unknown

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? N/A

General site features: Elevation 8200', lower; 8800', upper ,
Slope 10° , Aspect SW, lower; NW, upper

Land use: Mining X , Recreational___, Residential___, Urban___,
Agricultural___, Other(Specify)

Area of disturbed/unvegetated lands? 1.6 acres.
Dimensions:

Predominant vegetation types: Pine, grasses

Access: roads - good X ,poor___,4wd___,trail___.
Other logistical considerations (proximity to other sites). Road good; good access to lower, walk to upper due to locked gate.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site is underlain by Paleozoic limestones resting upon quartzites, schists, and gneisses. Unnamed tributary of Bear Gulch flows east to west adjacent to WR-1.

Mining/milling history, ore type/tenor, host rock, gangue: 1860's to 1992; no other information available.

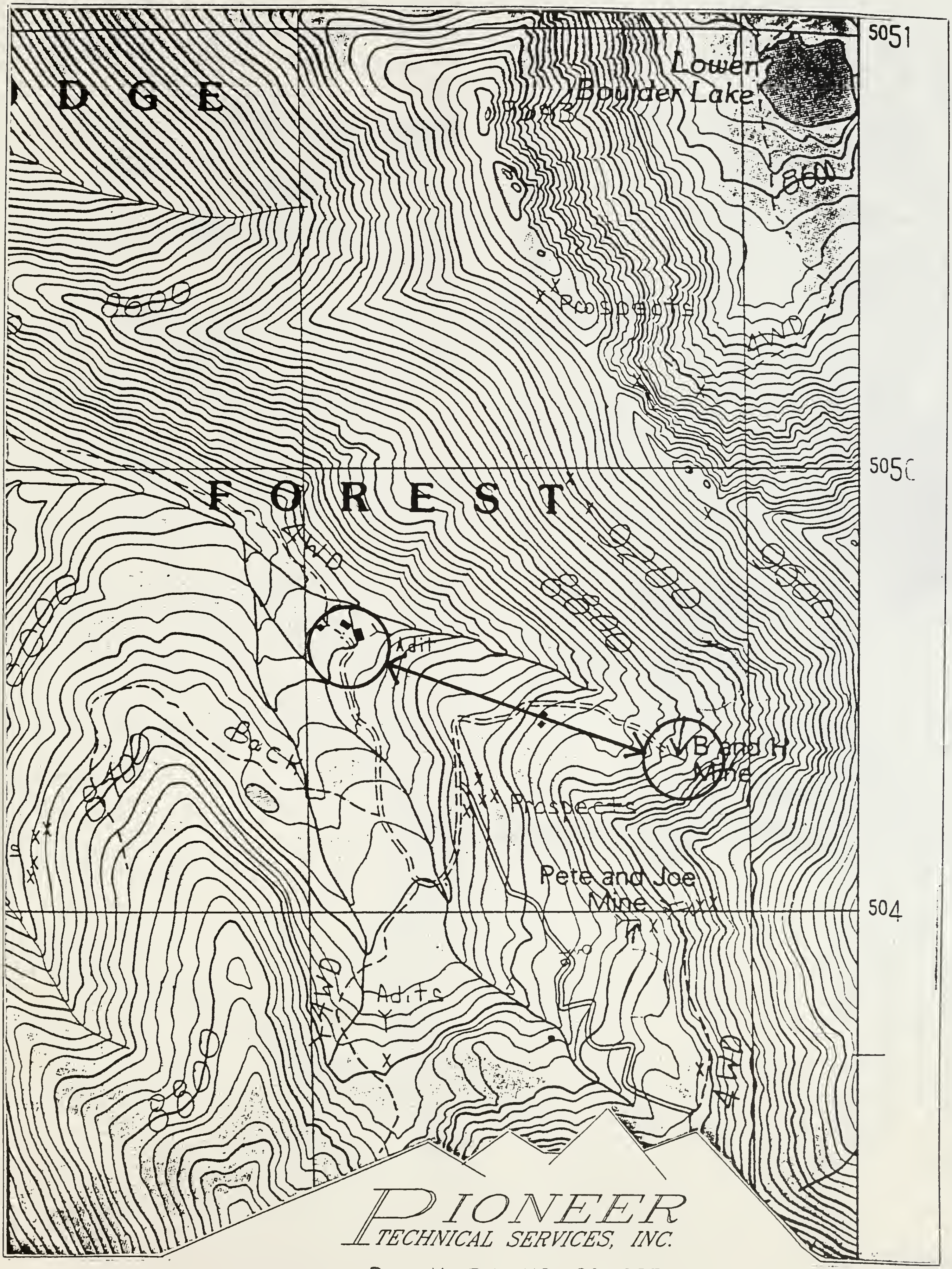
Mine Operation?
Shafts - Yes____, No X , # ____, Comment____
Adits - Yes X , No____, # 2 , Comment Locked doors
Pits - Yes____, No X , # ____, Comment____
Placers - Yes____, No X , # ____, Comment____
Other - Yes____, No X , # ____, Comment____

Mill Operation? Yes____, No X . If yes answer the next three questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill____ Dedicated Mill____; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN$^-$ leach (vat, heap), floatation, smelting?
N/A

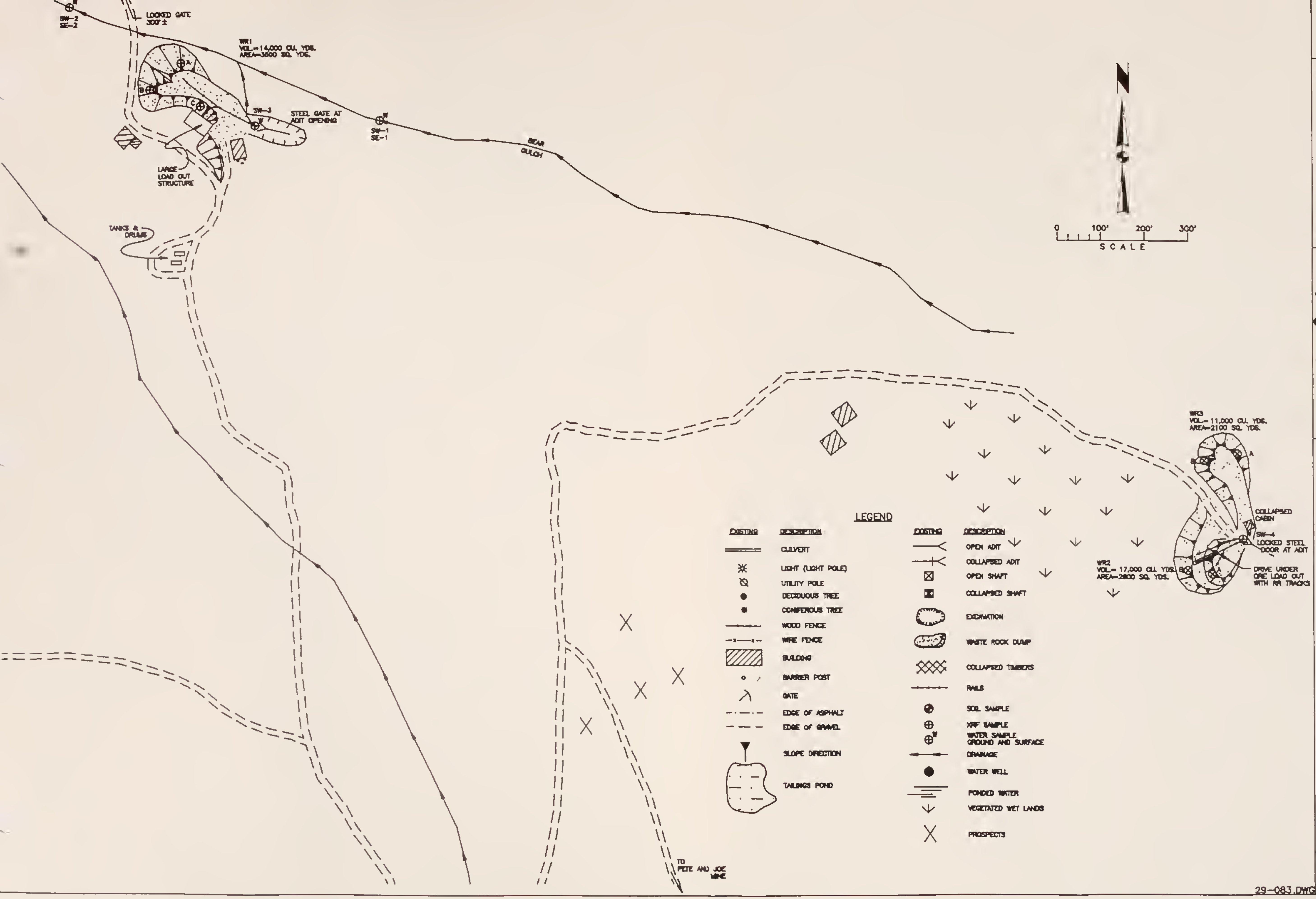


PIONEER
TECHNICAL SERVICES, INC.

B & H, P.A. NO. 29-083

T03S, R04W, SECTION 07

SCALE: 1' = 1000'



29-083.DWG

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

B AND H PA# 29-083
TIDAL WAVE DISTRICT MADISON COUNTY

PIONEER

DRAWN JTP DATE 23 OCT 93
DESIGNED TPR JOB NO. 93-17
APPROVED WJB F.B. NO.

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS–BOZEMAN–KALISPELL MONTANA
SPOKANE WASHINGTON

TDH

SHEET NO.

SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	14,000	Lower site; north side of dump	None	6.9 (D)	0.05	29-083-WR-1	07/23/93 1830	T-Metals, ABA
WR-1B	WR		Lower site; middle of dump	None	6.6 (D)	0.04			
WR-1C	WR		Lower site; south side of dump	None	7.0 (D)	0.04			
WR-2A	WR	17,000	Upper site; near tracks	None	6.2 (D)	0.035	29-083-WR-2	07/23/93 1845	T-Metals, ABA
WR-2B	WR		Upper site; south end, east of loadout	None	4.8 (D)	0.035			
WR-3A	WR	11,000	Upper site; northwest lobe, north side	None	6.2 (D)	0.05			
WR-3B	WR		Upper site; southwest lobe, north side	None	5.2 (D)	0.05			

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 29-083-WR-1 is composite of WR-1A through -1C. 29-083-WR-2 is composite of WR-2A and -2B, and WR-3A and -3B.
See Lakeshore (29-436) for background soil.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X , No___, Number: 2 Identification: One at lower and one at upper

Filled shafts: Yes___, No X , Number:____ Identification:____________

Seeps/Springs: Yes___, No X , Number:____ Identification:____________

Groundwater wells within 4 miles?: Yes X , No___;
Number of well logs: 4

Distance to nearest well used for drinking? Approx. 4 miles (mouth of Bear Gulch)

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible X , Unlikely____.
Uncontained sources with elevated metals, groundwater expression at surface.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: Babits

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-3	AD	Discharging adit at lower site	50 gpm (E)	7.60	NM	163	4.8	112	N/A	29-08-SW-3	07/23/93 1015	T-Metals, TDS, Hardness, Cl-, SO4, NO2/NO3
SW-4	AD	Discharging adit at upper site	0.5 gpm (E)	7.87	NM	196	2.1	22	N/A	N/A	N/A	Field Parameters

*FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): NM = Not Measured

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X , No___, Name(s): Unnamed tributary of Bear Gulch

Dry streambeds: Yes____, No X , Name(s):

Other surface water: Yes____, No X , Name(s)/Description:

Waste materials within any floodplain: Yes X , No___ Source ID(s): WR-1 is in unnamed tributary.

Approximate Flood frequency? X 1 yr, ___10 yr, ___100 yr

Estimated seasonal flow of stream(s) (cfs)? 1.15 during investigation
High Flow: 10 cfs , Average Flow: 1.2 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes____, No X ,
Describe:

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Wetland, fishery, irrigation

Observed erosional/sedimentation/stream turbidity problems? Yes_____, No X , Distance downstream (ft)?________ Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):
None observed during this investigation.

SURFACE WATER INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	200' upgradient from discharging adit in unnamed tributary	7.73	NM	189	5.2	22	1.15 cfs (M)	29-083-SW-1	07/23/93 1000	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	200' upgradient from discharging adit in unnamed tributary	N/A	N/A	N/A	N/A	N/A	N/A	29-083-SE-1	07/23/93 1000	T-Metals
SW-2	SW	60' downgradient of WR-1 in unnamed tributary	7.72	NM	70	5.5	63	1.15 cfs (M)	29-083-SW-2	07/23/93 1000	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-2	SE	60' downgradient of WR-1 in unnamed tributary	N/A	N/A	N/A	N/A	N/A	N/A	29-083-SE-2	07/23/93 0950	T-Metals

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): NM = Not Measured

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? (SO_3)

Presence of evaporative salt deposits? (ESD)

Discolored or turbid seepage? (SPG)

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? (FEOX)

Presence of burned or stressed vegetation? (VEG)

pH ≤ 5.0 (pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 5 acres

Wetlands present: Yes___, No_X_, Describe:

Carbonate rocks/soils: Yes_X_, No___, Describe: Limestone

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30_X_; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence(ft or miles)? 4 miles (seasonal cabins)

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	SO3	Moist	31,500	31,500	Yes	Low
WR-2	SO3; pH	Moist	23,400	23,400	Yes	Low
WR-3	SO3	Moist	18,900	18,900	Yes	Low

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No_X_, Describe:____________________

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments None

Evidence of recreational use on site: Yes___, No_X_, Describe:____________________

Accessibility - Fences, warning signs, closed roads? Locked gate

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment____________________
Wilderness Area - Yes___, No_X_, Comment____________________
T&E Species Habitat - Yes___, No_X_, Comment____________________
Bat Habitat - Yes___, No_X_, Comment____________________

Primary Drainage___; Secondary Drainage___; No Information_X_:

Riparian Habitat Quality - High___, Medium___, Low___
Wetlands Frontage - High___, Medium___, Low___
Fisheries Habitat and Species Classification - ___
Sport Fishery Classification - ___

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes___, No_X_, Number____, types and locations: There are two openings; however, they are locked.

Hazardous structures: Yes___, No_X_, Number____, types and locations:____________________

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____, types and locations:____________________

Unstable waste piles, impoundments, undercut banks: Yes____, No_X_, Number____, types and locations:____________________

Fire and/or Explosion hazards: Yes___, No_X_, Explain:____________________

Bibliography

MBMG, Geology and Ore Deposits of the Southern Tidal Wave Mining District, Madison County, Montana, Bulletin 24, Written by Willis M. Johns, November 1961.

MBMG, Sampling and Analysis Plan and Analytical Data for B&H Mine, Provided by Ted Duaime, Date Unknown.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Lands National Inventory, Phase II Problem Area Data Sheet for the B&H Mine, Prepared by Tierra Buena Contracting, December 28, 1982.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for the B & H Mine, Prepared by Chen-Northern, October, 12, 1989.

USGS, Mining Districts of the Dillon Quadrangle, Montana, and Adjacent Areas, Bulletin 574, Written by Alexander N. Winchell, 1914.

USGS, Topographic Map, Old Baldy Mountain, Montana, 7 1/2 minute Quadrangle, 1989.

LABORATORY ANALYTICAL DATA

B & H
PA NO. 29-083

B&H PA# 29-083
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BABITS
INVESTIGATION DATE: 07/23/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-083-SE-1	35	142 J	5.6	18.4 J	116	261 J	31800	0.461 J	927	70 J	679 J	18 U	403 J	NR
29-083-SE-2	80	143 J	4.1	16.5 J	52.9	232 J	35900	0.108 J	3390	58 J	132 J	7 U	436 J	NR
29-083-WR-1	51	289 J	4.2	17.3 J	108	215 J	28200	1.47 J	764	52 J	81 J	5 U	422 J	NR
29-083-WR-2	113	154 J	3.8	42.4 J	158	2930 J	80100	0.093 J	2040	196 J	68 J	6 U	121 J	NR
BACKGROUND	25 J	260 J	1.1	6.9 JX	19.9 JX	32.4 J	15900 J	0.246	935 J	18 J	16	8 UJ	105 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
29-083-WR-1	0.47	14.7	9.52	-5.1	0.17	0.12	0.18	3.75	5.77
29-083-WR-2	2.6	81.2	61.7	-19.	<0.01	1.38	1.33	43.1	18.6

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-083-SW-1	2.4	24.2 JX	4.2 J	9.7 U	8.87 J	2.63 J	48.6 J	0.038 U	4.08 U	12.7 U	0.95 J	30.7 U	7.57 U	55.4
29-083-SW-2	1.18 U	20.8 JX	2.57 U	9.7 U	7.57 J	2.37 J	117 J	0.038 U	28.1	12.7 U	0.72 U	30.7 U	10 J	95.8
29-083-SW-3	3.76	13.3 JX	2.57 U	9.7 U	9 J	2.63 J	308 J	0.038 U	103	12.7 U	0.72 U	30.7 U	13.6 J	192

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-083-SW-1	97	< 5.0	34	< 0.05	NR
29-083-SW-2	154	< 5.0	50	< 0.05	NR
29-083-SW-3	274	< 5.0	81	< 0.05	NR

LEGEND

SE1 - 200' upgradient from discharging adit in unnamed tributary.
SE2 - 60' downgradient of waste rock dump 1 in unnamed tributary.
WR1 - Composite of subsamples WR1A, 1B, and 1C.
WR2 - Composite of subsamples WR2A, 2B, 3A, and 3B.
BACKGROUND - From Lakeshore (29-436-SS-1).

SW1 - Same as SE1.
SW2 - Same as SE2.
SW3 - Discharging adit at lower site.

XRF ANALYSIS RESULTS

B & H
PA NO. 29-083

Mine Name: B & H PA# 29-083
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
29-083-WR1-A		20043.6	13481.4	2483.71		1195.98 *	36491.9		110.831 *	67.8238 *	46.0192 *	498.03
29-083-WR1-B		18482	13382.7	1504.39	201.302 *	2894.77	68621.5		3434.3	156.441 *	129.84	34.9283
29-083-WR1-C		11364.2	31395.6	2230.12		1768.98	48905.4		69.8705 *	90.8879 *	71.2005 *	217.139
29-083-WR2-A	862.01 *	12946	8274.15	3340.09	472.556 *	4073.54	88150.5		487.72	1043.67	125.305 *	314.068
29-083-WR2-B		12094.9	9455.01	1637.87		742.411 *	18269		62.472 *	83.8351 *	62.4549 *	190.657
29-083-WR3-A		16235.4	4498.3	935.968			31982.1		326.533	528.304	122.919 *	230.141
29-083-WR3-B		16165.5	8717.36	1476.51		761.151 *	14815.3			152.66	74.2017 *	141.624
29-083-WR-1-COMP	385.742 *	16156.2	8636.34	1828.55	422.232 *	1689.61	50011.8		305.425	603.787	98.197 *	201.448
29-083-WR-2-COMP		16150.5	17998.9	1688.35	152.304 *	1906.55	47956		855.471	84.1485 *	100.837 *	214.756

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
29-083-WR1-A	161.7				116.121			1028.06		22.154 *	20.168 *
29-083-WR1-B	53.4363				109.784	155.266 *		145.198			7.80669 *
29-083-WR1-C	65.5128			24.1691 *	80.7697			496.816	133.563 *	12.0821 *	8.07014 *
29-083-WR2-A	80.8197		62.7747		82.9412			907.447	116.382 *		12.6376 *
29-083-WR2-B	140.987			22.196 *	126.609			1077.66	77.0179 *	21.8252 *	28.5693
29-083-WR3-A	139.952		24.1142	165.952	132.999			1015.92	111.089 *	17.488 *	26.5935
29-083-WR3-B	146.513				127.906			1063.41	73.258 *	16.3633 *	21.3793 *
29-083-WR-1-COMP	130.332		12.649 *	51.0168 *	104.158			918.694	88.1203 *	12.4655 *	10.8305 *
29-083-WR-2-COMP	80.6997				98.1816			543.468	145.749 *		13.1287 *

* – Estimated Quantity
$ – Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

B & H
PA NO. 29-083

AIMSS SCORESHEET

SITE NAME: B & H
PA NUMBER: 29-083

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	4.811
6	GW - TARGETS	WELLS - 1 MI. x 2.5		0.0
7		WELLS - 1 TO 4 MI		4
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	4.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	7698
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	700
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	5.677
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19		FISHERY		0
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	17
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	67556
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.039
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31		WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	10
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	20
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		0
37A		ACCESSIBILITY		5
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	25
38		LIKELIHOOD SCORE	LINES 36 + 37C	25
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.030
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		0
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 THRU 42	0
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	0
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000			**0.75**

SITE NAME: B & H
PA NUMBER: 29-083

SITE SAFETY

LINE NO.				
1	THREAT	ACCESSIBILITY		5
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	0
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 THRU 11	0
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**0.00**

SUMMARY OF HISTORICAL ANALYTICAL DATA FROM OTHER SOURCES

LAB ID	SAMPLE ID	Cr	Crc	Crq	Ni	Nic	Niq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
DISSOLVED METALS: (ppb)																			
92Q881	FNPS10M	0.00	U		0.00	U		3.78	B		20.04	B		4.91	B		0.00	U	
92Q882	FNPS20M	0.00	U		0.00	U		0.00	U		36.52	B		1.76	B		0.00	U	
92Q883	FNPS30M	0.00	U		0.00	U		3.29	B		42.82			5.30	B		0.00	U	
92Q887	FNPS40L	-1.34	U		0.14	U		2.22	U		20.68			0.89	U		-1.12	U	
92Q888	FNPS50L	-1.42	U		0.06	U		1.91	U		55.58			0.67	U		-1.11	U	
92Q880	FNPS60L	0.00	U		0.00	U		0.00	U		0.00	U		0.00	U		0.00	U	
TOTAL RECOVERABLE METALS: (ppb)																			
92Q974	FNPS40L	0.00	U		0.00	U		2.82	B		31.96	B		0.00	B		0.00	U	
92Q975	FNPS50L	0.00	U		0.00	U		0.00	U		16.54	B		2.70	B		0.00	U	
TOTAL METALS: (ppm)																			
92S889	FNPD10H	3.62	B		0.52	U		319.91		N	16561.08		N	445.26			70.23		
92S890	FNPD20H	0.00	U		0.00	U		1.72	U	N	1.94	U	N	0.00	U		0.00	U	

B AND H MINE

LAB ID	SAMPLE ID	Cr	Crc	Crq	Ni	Nic	Niq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
DISSOLVED METALS: (ppb)																			
92Q1471	JBHS10M	-1.50	U		0.53	U		1.44	U		5.15	U		-0.26	U		-1.14	U	
92Q1473	JBHS20L	-1.35	U		0.20	U		0.61	U		37.91			-0.13	U		-0.97	U	
TOTAL RECOVERABLE METALS: (ppb)																			
92Q1472	JBHS10M	0.00	U		0.00	U		0.00	U		5.68	B		1.94	B		0.00	U	
92Q1474	JBHS20L	0.00	U		0.00	U		0.00	U		4.48	U		1.77	B		0.00	U	
TOTAL METALS: (ppm)																			
92S1475	JBHD10M	22.95			12.15	B		291.82		N	263.00			120.22			8.24	B	

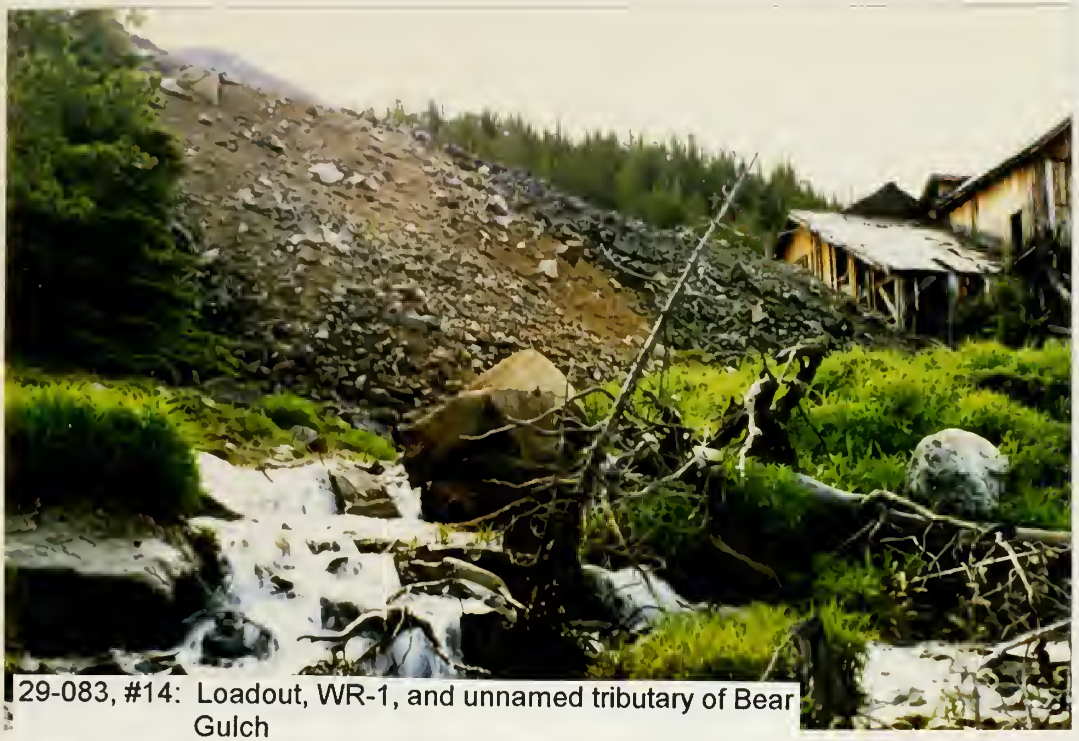
QUEEN MINE

LAB ID	SAMPLE ID	Cr	Crc	Crq	Ni	Nic	Niq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
DISSOLVED METALS: (ppb)																			
92Q898	BQNS10L	-1.32	U		-0.34	U		2.00	U		14.91	B		0.47	U		-1.14	U	

LITTLE QUEEN MINE

LAB ID	SAMPLE ID	Cd	Cdc	Cdq	Ba	Bac	Baq	Pb	Pbc	Pbq	Hg	Hgc	Hgq
DISSOLVED METALS: (ppb)													
92Q881	FNPS10M	0.00	U		35.34	B		2.82	B				
92Q882	FNPS20M	0.60	B		29.25	B		3.88	B				
92Q883	FNPS30M	0.80	B		43.71	B		5.76	B				
92Q887	FNPS40L	-0.68	U		23.66	B		3.66					
92Q888	FNPS50L	-0.74	U		20.91	B		-0.77	U				
92Q880	FNPS60L	0.00	U		0.00	U		0.00	U				
TOTAL RECOVERABLE METALS: (ppb)													
92Q974	FNPS40L	0.00	U		26.27	B		45.97			0.07	B	
92Q975	FNPS50L	0.00	U		20.38	B		0.00	U		0.09	B	
TOTAL METALS: (ppm)													
92S889	FNPD10H	111.83			627.33			4949.94			194.75		
92S890	FNPD20H	0.00	U		0.00	U		0.00	U		0.11	B	
B AND H MINE													
DISSOLVED METALS: (ppb)													
92Q1471	JBHS10M	1.96	B		19.58	B		-0.59	U				
92Q1473	JBHS20L	0.82	U		19.89	B		-0.92	U				
TOTAL RECOVERABLE METALS: (ppb)													
92Q1472	JBHS10M	0.00	U		16.89	B		0.00	U		0.09	B	
92Q1474	JBHS20L	0.00	U		16.93	B		0.00	U		0.09	B	
TOTAL METALS: (ppm)													
92S1475	JBHD10M	1.82	B		83.92	B		649.93		N.	2.87		
QUEEN MINE													
DISSOLVED METALS: (ppb)													
92Q898	BQNS10L	-0.83	U		0.86	U		0.28	U				

LITTLE QUEEN MINE



29-083, #14: Loadout, WR-1, and unnamed tributary of Bear Gulch

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: DRY GULCH (SOUTH) PA#: 29-282

Date: July 20, 1993 Time: 0830-1230

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: Belanger, Pioneer
Clark, Pioneer

Visitors: None

Weather/Seasonality Observations: Overcast; occasional rain; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): No photos or video taken due to site being spread over approx. one square mile.

General Comments/Observations (not covered specifically in attached Inventory Forms): Site is mostly reclaimed; a few dumps, adits, and shafts are not reclaimed. There is no water on the site.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Close the remaining openings. Smooth and revegetate dumps; pull few dumps out of drainage.

MDSL AMRB/PIONEER 4/9/93

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): DRY GULCH (SOUTH) PA#: 29-282

Legal Description: T 3S ;R 5W ;Sec. 15 , W 1/2 ___1/4 ___1/4
Sec. 16 , E 1/2

County: MADISON Mining District: TIDAL WAVE

Latitude: N 45° 34' 40" Longitude: W 112° 12' 50"

Primary Drainage Basin and Code: Jefferson River/10020005
Secondary Drainage Basin: Dry Gulch/Spring Creek

USGS Quadrangle map name(s): Old Baldy Mountain

Mine Type/Commodities: Hardrock/Gold, Silver, Lead

Activity Status: Active___,Inactive/Exploration___,Abandoned X .

Ownership status: Known YX N__; private/public? Private
Owner, Agent, or Contact(Include address and phone when available): Howard and Gail Evans, 3884 E. Shore Drive, Canyon Ferry, Helena, MT 59601-9740.

Relationship to other mines/sites in the area/district: Ohio mine located to the north, 4.5 miles; Pete & Joe and B & H mines to the east, 4 miles; Mofrat mine northeast, 2 miles; and, Elenora mine southeast, 3 miles.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? Shaft and adit closings; revegetated on parts of site near roads by DSL.

General site features: Elevation 5800'-6400', Slope Moderate ,
Aspect West and Southwest

Land use: Mining___, Recreational X , Residential___, Urban___,
Agricultural X , Other(Specify)

Area of disturbed/unvegetated lands? 2-5 acres.
Dimensions: The site is spread over approximately 1 sq. mile.

Predominant vegetation types: Juniper, pine, sage, grasses

Access: roads - good X ,poor___,4wd X ,trail___.
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 2 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site is underlain by Pony Gneiss. The site lies on both sides (north and south) of Dry Gulch. Water leaving the site flows northwest to confluence with Spring Creek between 2.5 to 3 miles away.

Mining/milling history, ore type/tenor, host rock, gangue: Fissure type deposit, argentiferous galena with some gold. No other information available.

Mine Operation?
Shafts - Yes X, No ___, # 7, Comment 5 reclaimed/caged
Adits - Yes X, No ___, # 17, Comment 10 reclaimed; none open
Pits - Yes ___, No X, # ___, Comment
Placers - Yes ___, No X, # ___, Comment
Other - Yes ___, No X, # ___, Comment

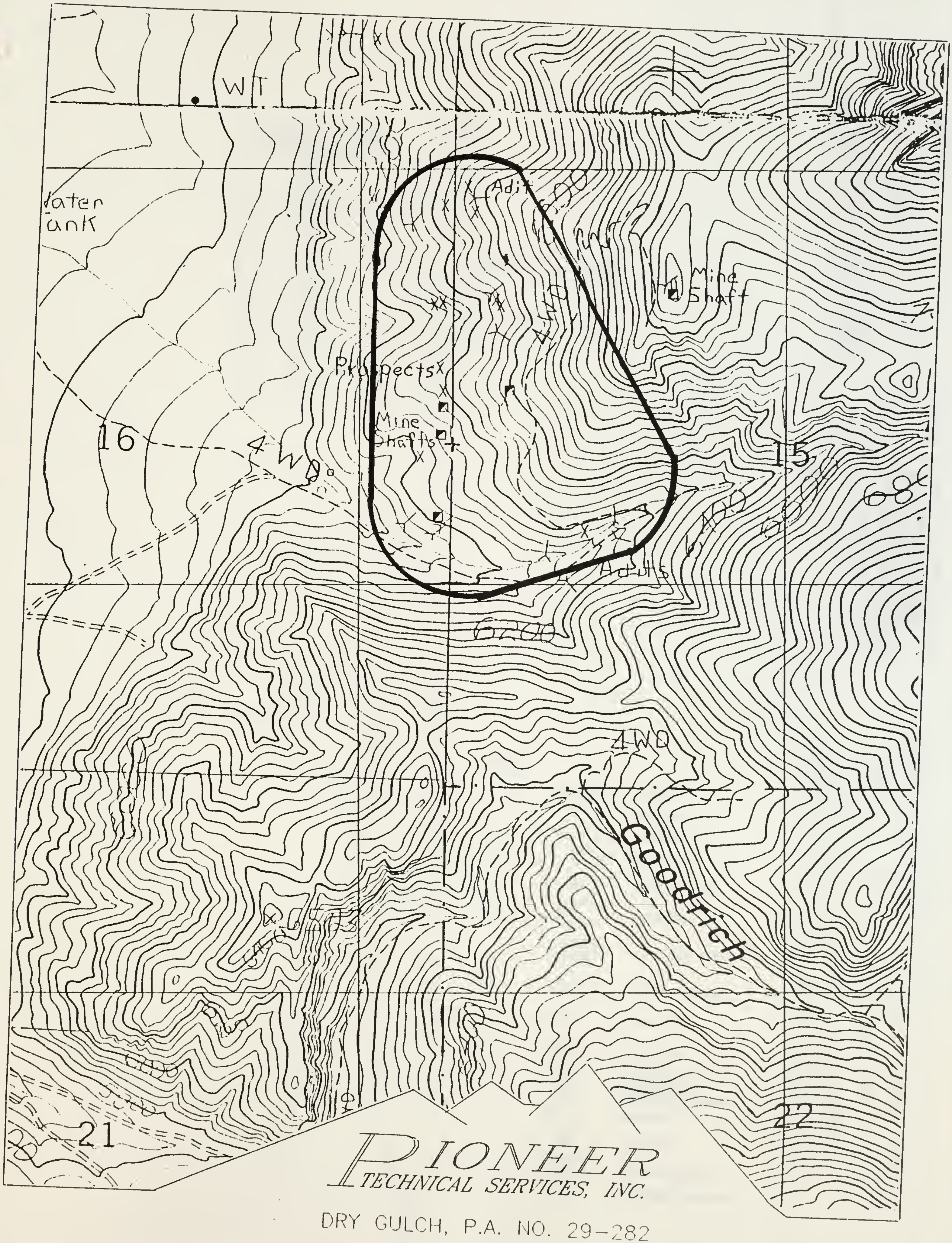
Mill Operation? Yes ___, No X. If yes answer the next three questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill ___ Dedicated Mill ___; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting?
N/A

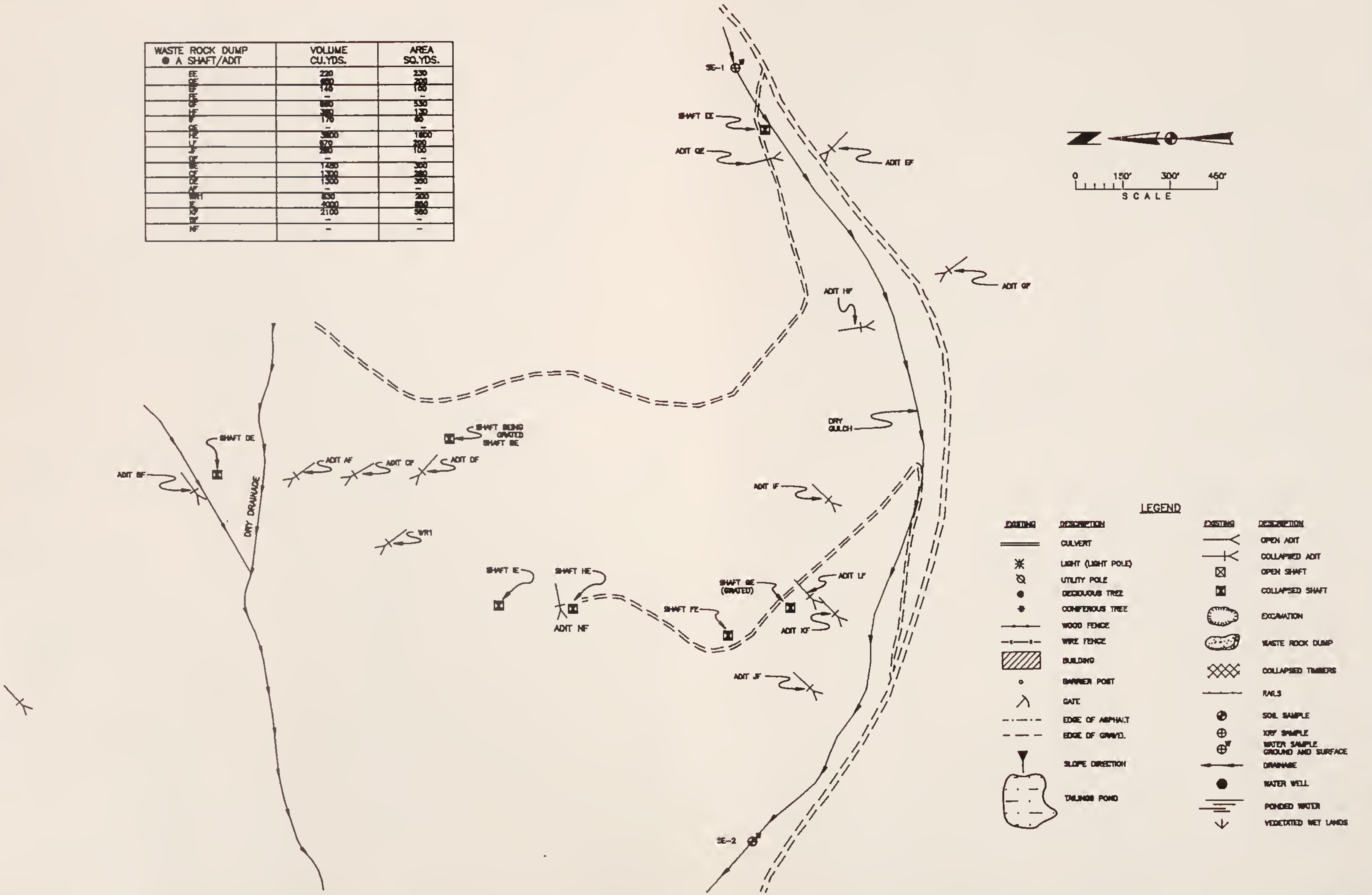
Well No.	Location	Depth	Yield	Static Water Level
107598	03S 05W 16 AAD	12.0	150.0	0.00
M:107599	03S 05W 16 AAD	18.0	50.0	9.00



PIONEER
TECHNICAL SERVICES, INC.

DRY GULCH, P.A. NO. 29-282
T03S, R05W, SECTION 15
SCALE: 1" = 1000'

WASTE ROCK DUMP ● A SHAFT/ADIT	VOLUME CU.YDS.	AREA SQ.YDS.
EE	220	230
GE	650	200
EF	140	100
FE	–	–
GF	800	530
HF	750	130
IF	170	80
OE	–	–
HE	3600	1650
LF	670	200
JF	280	100
DF	–	–
BE	1480	350
CF	1300	280
DE	1300	350
AF	–	–
WR1	830	200
IE	4000	850
KF	2100	500
BF	–	–
NF	–	–



DRAWN JTP DATE 22 OCT 93
DESIGNED TPR JOB NO. 93-17
APPROVED DT F.B. NO.

PIONEER

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS–BOZEMAN–KALISPELL MONTANA
SPOKANE WASHINGTON

TD&H

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY
DRY GULCH SOUTH PA# 29-282
TIDAL WAVE DISTRICT MADSION COUNTY

SHEET NO.

29-282.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Tuesday, Belanger, Clark*

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-JF	WR	280	Assoc. with Adit JF; SE of brick structure	None	6.5 (D)	0.05	29-282-WR-1	07/20/93 2115	T-Metals, ABA
WR-KF	WR	2,100	Assoc. with Adit KF; E of brick structure, N of road	None	6.2 (D)	0.03			
WR-LF	WR	670	Assoc. with Adit LF; NE of KF	None	NM	NM			
WR-GE	WR		Assoc. with Shaft GE; N of grated shaft, closest to brick cabin	None	6.6 (D)	0.03			
WR-IF	WR	170	Assoc. with Adit IF; W of HF, N of road	None	6.5 (D)	0.05			
WR-FE	WR		Dump on road; NE of brick cabin	None	6.1 (D)	0.03			
WR-HE	WR	3,800	Assoc. with Shaft HE and Adit NF; at end of first road	None	NM	NM			
WR-HF	WR	360	Assoc. with Adit HF; W of WR-GF	None	6.2 (D)	0.03			
WR-GF	WR	960	SSW of Adit EF; W of road	None	6.4 (D)	0.04			
WR-EF	WR	140	Assoc. with Adit EF; south of Shaft EE, by second road junction	None	6.0 (D)	0.03			
WR-QE	WR	650	Near Adit QE, by second road junction	None	6.7 (D)	0.04			
WR-EE	WR	220	Near Shaft EF, by second road junction	None	6.8 (D)	0.05			

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 29-282-WR-1 is composite of all waste rock samples on this page. NM = Not Measured

*Continued on next page

SOURCE INVENTORY FORM (Cont'd)

SAMPLERS: Tuesday, Belanger, Clark

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd³)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-IE	WR	1,450	W of Shaft IE; SW of Adit QE	None	6.4 (D)	0.04	29-282-WR-2	07/20/93 2130	T-Metals, ABA
WR-CF	WR	1,300	Assoc. with Adit CF; S of W drainage	None	6.6 (D)	0.04			
WR-DE	WR	1,300	N dump by open Shaft DE	None	6.6 (D)	0.04			
WR-DF	WR		Assoc. with Adit DF; NW of Shaft BE	None	NM	NM			
WR-BE	WR	1,450	On ridge S of W drainage, by grated shaft	None	6.6 (D)	0.05			
WR-BF	WR		Assoc. with Adit BF; NW of Shaft DE	None	NM	NM			
WR-AF	WR		Assoc. with Adit AF; S of Shaft DE	None	NM	NM			
WR-1	WR	830	S of N drainage; W of grated shaft	None	6.8 (D)	0.05			
SS-1	BKGRND	N/A	Background soil	N/A	N/A	N/A	29-282-SS-1	07/20/93	T-Metals

[*] D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 29-282-WR-2 is composite of all waste rock samples on this page. NM = Not Measured

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No X , Number:____ Identification:____________

Filled shafts: Yes___, No X , Number:____ Identification:____________

Seeps/Springs: Yes___, No X , Number:____ Identification:____________

Groundwater wells within 4 miles?: Yes X , No___;
Number of well logs: 19

Distance to nearest well used for drinking? 5 miles to the town of Twin Bridges; possible ranch located within 3 miles.

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible____, Unlikely X .
Relatively high soil pH, fairly low metals values; very dry area with low precipitation.

Other observations/notes: There is a stock well on south side of Dry Gulch drainage at canyon mouth.

GROUNDWATER INVENTORY FORM

SAMPLERS: ____________________

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.												

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________________

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes____, No_X_, Name(s):________________

Dry streambeds: Yes_X_, No___, Name(s): Dry Gulch

Other surface water: Yes____, No_X_, Name(s)/Description:____________

Waste materials within any floodplain: Yes_X_, No___ Source ID(s): WR-EF

Approximate Flood frequency? _X_1 yr, ___10 yr, ___100 yr

Estimated seasonal flow of stream(s) (cfs)? < 0.5 cfs
High Flow:___________, Average Flow:______________

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes____, No_X_,
Describe:____________________

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Dry Gulch disappears into the valley; may go into irrigation ditches.

Observed erosional/sedimentation/stream turbidity problems? Yes_____, No_X_, Distance downstream (ft)?________ Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):__________

SURFACE WATER INVENTORY FORM

SAMPLERS: Tuesday, Belanger

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SE-1	SE	Upstream in Dry Gulch	N/A	N/A	N/A	N/A	N/A	N/A	29-282-SE-1	07/20/93 1000	T-Metals
SE-2	SE	Downstream in Dry Gulch	N/A	N/A	N/A	N/A	N/A	N/A	29-282-SE-2	07/20/93 1200	T-Metals

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ______

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 10 acres

Wetlands present: Yes___, No X , Describe:

Carbonate rocks/soils: Yes___, No X , Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 X ; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence(ft or miles)? Ranch approx. 3 miles northwest on map

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Tuesday, Belanger, Clark

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)	
WR-BE	FEOX	Dry	2,700	2,160	Yes	Low	
WR-CF	FEOX	Dry	2,520	0	Yes	Low	
WR-DE	FEOX	Dry	3,150	2,520	Yes	Low	
WR-1	FEOX	Dry	1,800	1,440	Yes	Low	
WR-IE	FEOX	Dry	7,650	0	Yes	Low	
WR-KF	FEOX	Dry	5,220	4,698	Yes	Low	
WR-EE	FEOX	Dry	2,070	0	Yes	Low	
WR-QE	FEOX	Dry	1,800	1,260	Yes	Low	
WR-EF	FEOX	Dry	900	720	Yes	Low	
WR-GF	FEOX	Dry	4,770	0	Yes	Low	
WR-HF	FEOX	Dry	1,170	819	Yes	Low	
WR-IF	FEOX	Dry	540	540	Yes	Low	
WR-FE	FEOX	Dry	NC	0	Yes	Low	
WR-GE	FEOX	Dry	NC	0	Yes	Low	
WR-HE, WR-NF	FEOX	Dry	13,500	0	Yes	Low	
WR-LF	FEOX	Dry	1,800	1,800	Yes	Low	
WR-JF	FEOX	Dry	900	630	Yes	Low	

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No_X__, Describe:____________________

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments_None________

Evidence of recreational use on site: Yes_X_, No___, Describe:_______ Hunting, shooting

Accessibility - Fences, warning signs, closed roads?_Unrestricted___

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment__________
Wilderness Area - Yes___, No_X_, Comment__________
T&E Species Habitat - Yes___, No_X_, Comment__________
Bat Habitat - Yes___, No_X_, Comment__________

Primary Drainage___; Secondary Drainage___; No Information_X_:

Riparian Habitat Quality - High___, Medium___, Low___
Wetlands Frontage - High___, Medium___, Low___
Fisheries Habitat and Species Classification - ___
Sport Fishery Classification - ___

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_2__, types and locations:___ Adit QE and Shaft DE

Hazardous structures: Yes_X_, No___, Number_1__, types and locations:_ Stone cabin near road

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____, types and locations:__________

Unstable waste piles, impoundments, undercut banks: Yes____, No_X_, Number____, types and locations:__________

Fire and/or Explosion hazards: Yes___, No_X_, Explain:__________

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Dry Gulch South site, Prepared by Northern Engineering and Testing, October 5, 1988.

USGS, Topographic Map, Old Baldy Mountain, Montana, 7 1/2 minute Quadrangle, 1989.

LABORATORY ANALYTICAL DATA

DRY GULCH (SOUTH)
PA NO. 29-282

Dry Gulch South PA# 29-282
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 07/20/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-282-SE-1	31 J	170 J	0.6 U	6.5 JX	14.5 JX	30.1 J	14200 J	0.309	592 J	21 J	38	7 UJ	76 JX	NR
29-282-SE-2	7 J	45.5 J	0.5 U	11.5 JX	37.4 JX	36.6 J	14400 J	0.13	331 J	50 J	7 U	5 UJ	40 JX	NR
29-282-WR-1	93 J	94.7 J	1.3	20.4 JX	71.6 JX	92.6 J	32600 J	0.453	614 J	104 J	469	6 UJ	190 JX	NR
29-282-WR-2	145 J	105 J	5.4	18.5 JX	57.8 JX	80.5 J	27400 J	1.01	1130 J	65 J	942	5 UJ	652 JX	NR
BACKGROUND	25 J	260 J	1.1	6.9 JX	19.9 JX	32.4 J	15900 J	0.246	935 J	18 J	16	8 UJ	105 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
29-282-SS-1	0.03	0.94	136	135	<0.01	0.01	0.03	0.31	136
29-282-WR-1	0.06	1.87	119	118	0.06	<0.01	<0.01	0	119
29-282-WR-1DUF	0.06	1.87	122	120	0.05	0.01	<0.01	0.31	122
29-282-WR-2	0.03	0.94	78	77.1	0.03	<0.01	<0.01	0	78

LEGEND

SE1 - Upgradient in Dry Gulch.
SE2 - Downgradient in Dry Gulch.
WR1 - Composite of subsamples WRJF, KF, LF, GE, IF, FE, HE, HF, GF, EF, QE, and EE.
WR2 - Composite of subsamples WRIE, CF, DE, DF, BE, BF, AE, and 1.
BACKGROUND - From Dry Gulch South (29-282-SS-1).
WR1DUP - Duplicate of saample 29-282-WR-1.

XRF ANALYSIS RESULTS

DRY GULCH (SOUTH)
PA NO. 29-282

Mine Name: Dry Gulch South PA# 29-282
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
29-282-WRB-E		26646.9	19361.8	1834.43	175.802 *	1003.36 *	29643.9			242.393	81.693 *	88.0728
29-282-WRB-F		39300.1	9743.08			1558.23	34951.9		129.162 *	584.761		214.042
29-282-WRC-F		24358	17131	1870		5328.34	47056.1		104.675 *	2251.76	313.428 *	122.959
29-282-WRD-E	483.143 *	17096.2	38830.2	1501.09	392.63 *	3004.3	38994.5			1105.5		89.4943
29-282-WRE-E		32336	10059.4	2177.17	166.414 *	887.151 *	33500.9			98.2414 *		36.7788
29-282-WRE-F		24263.2	27044.2	1679.9		770.878 *	27236.3		98.0545 *	147.079		52.1869
29-282-WRF-E		15346.6	62400	2787.91	230.316 *	1514.38	50191.3	476.108 *	60.3123 *	92.9159 *	100.55 *	161.828
29-282-WRG-E		16232.7	56308.9	2385.38		1582.88	52234.1			136.746 *	210.111	238.7
29-282-WRG-F		25120.8	2715.2	2749.99		330.871 *	49506.6		65.1706 *	100.812 *		75.8124
29-282-WRH-F	642.324 *	30366.9	5818.68	2349.16	359.771 *	2344.16	58147.4		57.8501 *	122.392 *		74.4239
29-282-WRI-E		28745.9	4478.73	2044.26		849.584 *	54472		214.945	1091.13	172.898 *	85.1839
29-282-WRI-F		23442.9	30325	1941.13		944.017 *	23539.8			66.492 *		132.383
29-282-WRJ-F		14806.8	43011.1	1644.55		1235.74	47123.8			103.189 *	39.5838 *	282.592
29-282-WRK-F		6937.02	47594.6	3985.78		1498.31	64110.8		72.6005 *	105.687 *		172.626
29-282-WRL-F		13550.3	46315.8	3061.14		1503.3	57494.6		59.3117 *	105.452 *	83.5404 *	185.057
29-282-WRQ-E		7440.64	1365.87	954.315	142.165 *	755.952 *	13645		51.2451 *	193.941		
29-282-WR-1		28481.5	23593.9	2238.91		4929.59	35679.5		109.622 *	2241.42		89.2598
29-282-WR-1-COMP		33585.5	50525.1	1200.67		2300.22	25689		110.006 *	721.893		295.488
29-282-WR-2-COMP		22238.1	27978.5	2776.83	229.62 *	2800.77	46643.9		78.6718 *	755.394		113.152

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
29-282-WRB-E	89.5819	76.0983 *		147.865	166.903			238.147		12.8729 *	6.89584 *
29-282-WRB-F	201.847	52.5924 *		212.691	237.087		65.9359 *	522.853		47.7619	43.6205
29-282-WRC-F	81.7858	36.0725 *		2367.32	177.794			419.661		11.0609 *	
29-282-WRD-E	55.1693	37.2455 *		758.389	134.628			387.071			9.41159 *
29-282-WRE-E	245.621			40.4921 *	137.212			227.743			
29-282-WRE-F	113.494	32.913 *		69.3175	145.051			184.82			
29-282-WRF-E	57.4835	40.0663 *		16.6114 *	95.9343			129.289			
29-282-WRG-E	55.1774			105.099	109.361			190.293			
29-282-WRG-F	127.268			820.493	141.551		47.959 *	539.363	88.1798 *		
29-282-WRH-F	144.056	43.3404 *			192.515		56.5755 *	446.587			9.64889 *
29-282-WRI-E	91.1361		5.52942 *	2285	174.848			173.775			11.2385 *
29-282-WRI-F	108.281	40.6264 *		15.8173 *	160.2			442.997			6.91765 *
29-282-WRJ-F	79.5516			18.0758 *	111.854		63.8048 *	115.226			
29-282-WRK-F	70.3737				49.2659			179.024			
29-282-WRL-F	64.7861			19.3432 *	82.2649			206.764			
29-282-WRQ-E	297.059			274.605	35.4225			68.4027			6.65681 *
29-282-WR-1	99.5358			1240.19	184.398			269.472	107.186 *		15.1431 *
29-282-WR-1-COMP	172.92	37.7842 *		459.026	203.647			516.517		28.7492 *	33.8019
29-282-WR-2-COMP	103.191	40.7089 *		635.328	151.705			289.573			

* - Estimated Quantity
$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

DRY GULCH (SOUTH)
PA NO. 29-282

AIMSS SCORESHEET

SITE NAME: DRY GULCH (SOUTH)
PA NUMBER: 29-282

LINE NO.				
		GROUNDWATER PATHWAY		
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		10
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	200
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	200
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	5.387
6		WELLS - 1 MI. x 2.5		5.0
7	GW - TARGETS	WELLS - 1 TO 4 MI		17
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	22.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	23703
		SURFACE WATER PATHWAY		
11		OBSERVED RELEASE		0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	400
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	5.898
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		0
19	SW - TARGETS	FISHERY		0
20		RECREATION		0
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	2
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	4718
		AIR PATHWAY		
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.085
29		POPULATION - 4 MILES		1
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	1
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	4
		DIRECT CONTACT PATHWAY		
36		OBSERVED EXPOSURE		50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.077
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		0
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		5
43		TARGETS SCORE	SUM LINES 40 THRU 42	5
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	58
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000			**0.28**

SITE NAME: DRY GULCH (SOUTH)
PA NUMBER: 29-282

SITE SAFETY

LINE NO.				
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	100
3		OPEN ADITS	50 EA.	50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	40
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	190
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 THRU 11	5
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**19.00**

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: ELEANORA MINES (East) PA#: 29-285

Date: September 4, 1993 Time: 1400-1600

Field Team Leader: Bullock, Pioneer

Sampling Personnel: None

Visitors: None

Weather/Seasonality Observations: Clear; calm; approx. 65°F; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #25: WR-1; #26: WR-2; #27: WR-3; #28: WR-4, #29: WR-5. Video Tape No. 6

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Close HMOs; amend and revegetate dumps.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): ELEANORA MINES (East) PA#: 29-285

Legal Description: T 3S ;R 5W ;Sec. 23 , SW1/4 SE1/4
Sec. 26 , NW1/4 NE1/4

County: MADISON Mining District: TIDAL WAVE

Latitude: N 45° 33' 10" Longitude: W 112° 10' 45"

Primary Drainage Basin and Code: Jefferson River/10020005
Secondary Drainage Basin: Goodrich Gulch

USGS Quadrangle map name(s): Old Baldy Mountain

Mine Type/Commodities: Hardrock/Unknown

Activity Status: Active___,Inactive/Exploration___,Abandoned X .

Ownership status: Known YX N__; private/public? Private/Public
Owner, Agent, or Contact(Include address and phone when available): Ronald Paige, P.O. Box 803, Philipsburg, MT 59858. (406) 859-3901; Beaverhead National Forest.

Relationship to other mines/sites in the area/district: Located across the hill from the Argenta mine.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? Openings have been surveyed for HMO closures.

General site features: Elevation 7800' , Slope 15°-25° ,
Aspect Northwest

Land use: Mining X , Recreational X , Residential___, Urban___,
Agricultural X , Other(Specify)

Area of disturbed/unvegetated lands? Approx. 2.5 acres.
Dimensions:

Predominant vegetation types: Douglas fir, Lodgepole pine, juniper, currant, and some grasses

Access: roads - good___,poor___,4wd X ,trail___.
Other logistical considerations (proximity to other sites). Road closure through private land up Goodrich Gulch. Accessed by foot up Wet Georgia Gulch by hiking up drainage where the Argenta Mine is located.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Mine workings are located on hillside well above Goodrich Gulch. Limestone is present with granite intrusive consisting of a fine-grained matrix of quartz and orthoclase containing a few phenocrysts of orthoclase, altered sericite, kaolinite, quartz, hematite, chlorite, and titanite.

Mining/milling history, ore type/tenor, host rock, gangue: No detailed history available in literature. Artifacts on-site date back to the late 1940's and early 1950's.

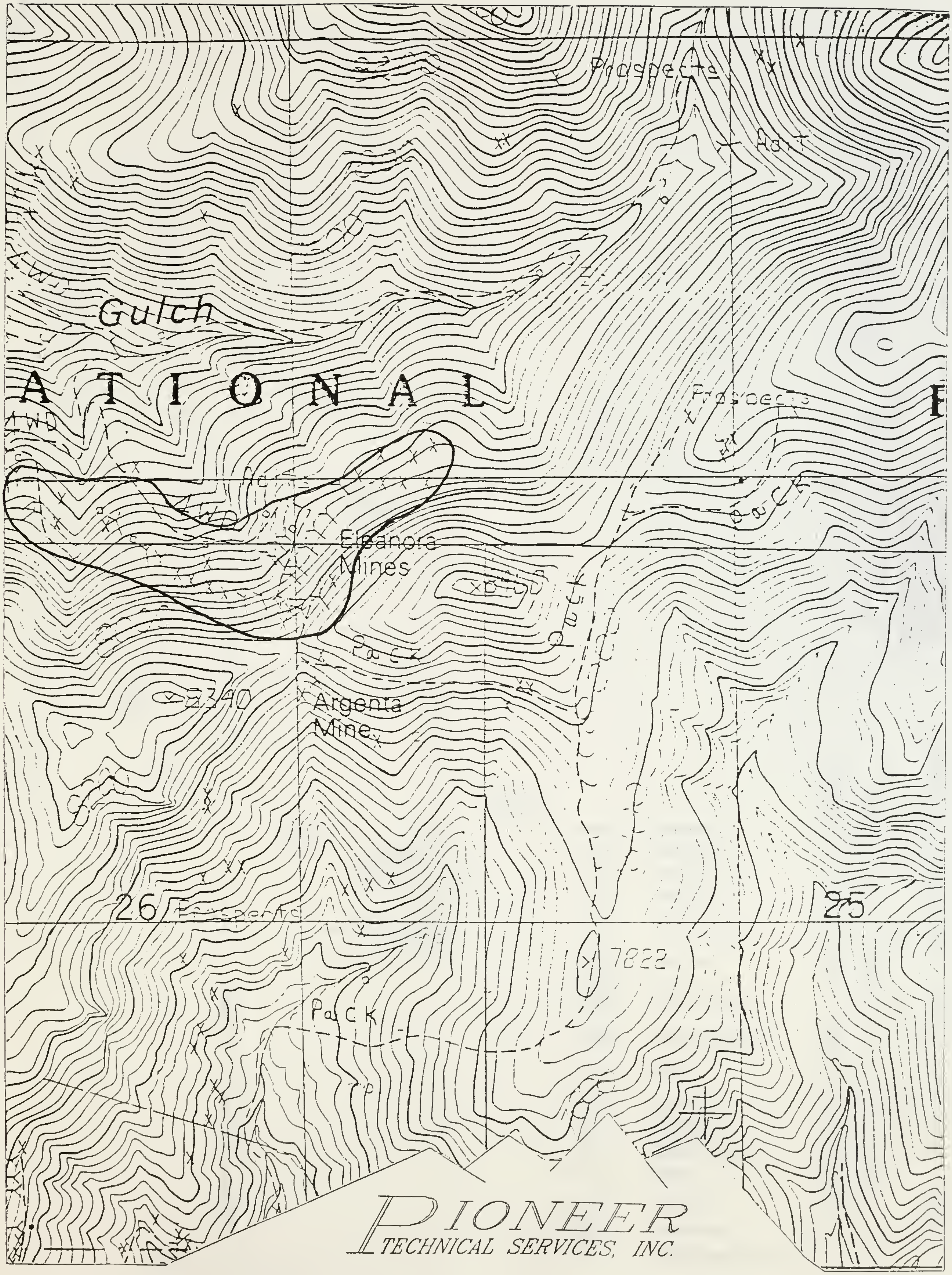
Mine Operation?
Shafts - Yes___, No X, # ___, Comment___
Adits - Yes X, No___, # 24, Comment Approx. 20 open
Pits - Yes___, No X, # ___, Comment___
Placers - Yes___, No X, # ___, Comment___
Other - Yes___, No X, # ___, Comment___

Mill Operation? Yes___, No X. If yes answer the next three questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill___ Dedicated Mill___; Number and names of mines that supplied mill feed: N/A

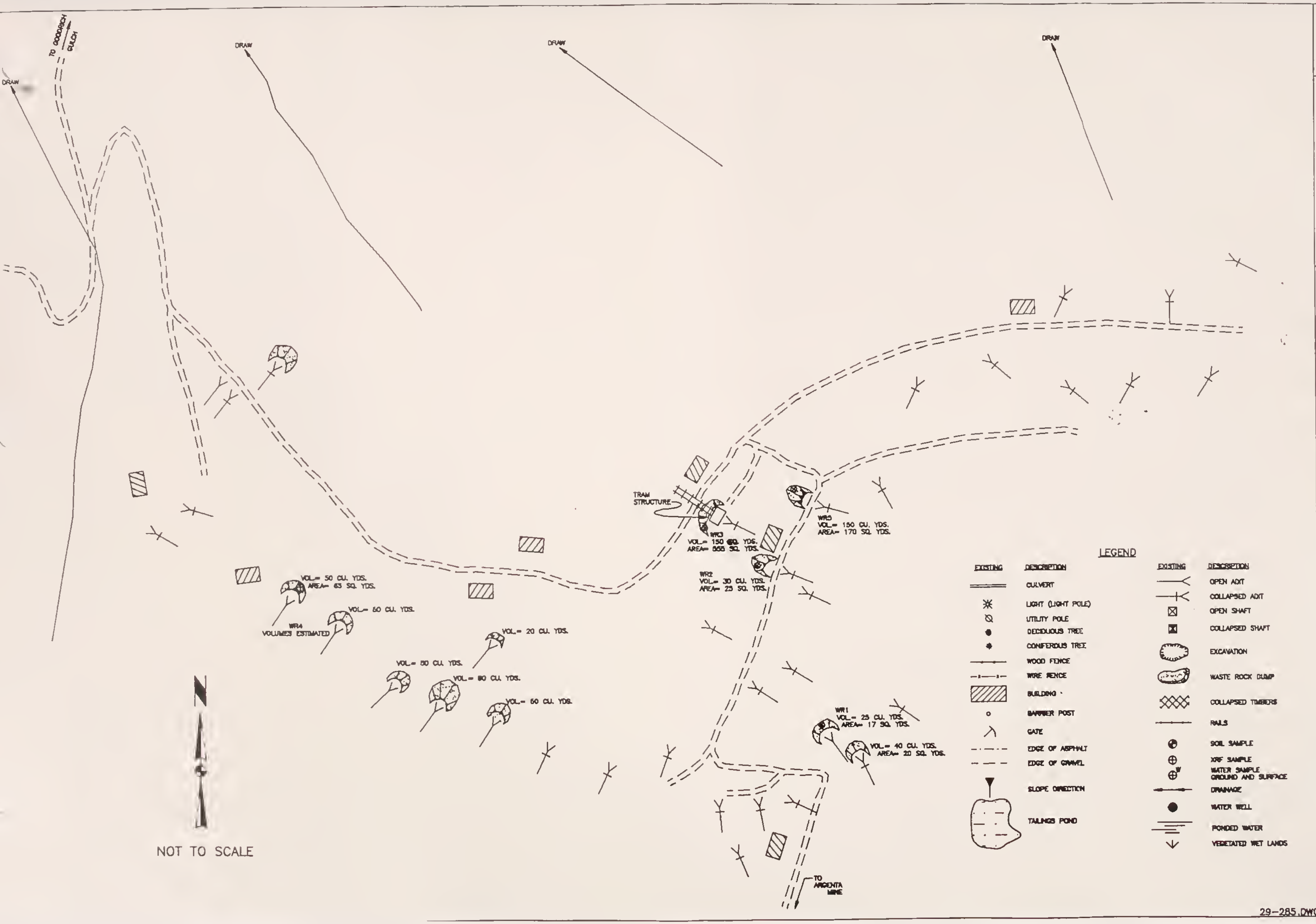
Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting?
N/A



ELEANOR MINES, P.A. NO. 29-285

T03S, R05W, SECTION 26

SCALE: 1" = 1000'



MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

ELEANOR EAST PA# 29-285
TIDAL WAVE DISTRICT MADISON COUNTY

PIONEER TECHNICAL SERVICES, INC. BUTTE, MT.

TD&H

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL MONTANA
SPOKANE WASHINGTON

DRAWN	JTP	DATE	1 NOV 93
DESIGNED	TPR	JOB NO.	93-17
APPROVED	WJB	F.B. NO.	

SHEET NO.

29-285.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Bullock

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd³)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)[*]	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1	WR	25	Southeastern most dump; brown sand	None	7.0 (D)	0.05	29-285-WR-1	09/07/93 1400	T-Metals, ABA
WR-2	WR	30	Dump located in approx. center of workings; brown sand	None	7.0 (D)	0.04	29-285-WR-2	09/07/93 1410	T-Metals, ABA
WR-3	WR	150	Dump below WR-2 near Tram; brown sand	None	7.0 (D)	0.04			
WR-4	WR	50	Southwestern end of workings; rocky sand	None	6.8 (D)	0.06			
WR-5	WR	150	Large dump between WR-1 and WR-2	None	7.0 (D)	0.04			

[*] D-Direct reading(Kelvey Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 29-285-WR-1 is composite of WR-1 and WR-4. 29-285-WR-2 is composite of WR-2, WR-3, and WR-5. Site has many other small dumps that were not sampled because they are mostly revegetated.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map o- topographic map.

Flowing adits: Yes___, No_X_, Number:____ Identification:______________

Filled shafts: Yes___, No_X_, Number:____ Identification:______________

Seeps/Springs: Yes___, No_X_, Number:____ Identification:______________

Groundwater wells within 4 miles?: Yes_X_, No___;
Number of well logs:_20_

Distance to nearest well used for drinking? Approx. 3 miles; many of the well logs may be BLM stock watering wells.

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible____, Unlikely_X_.
All workings appear to be dry. Small dump sizes indicate relatively shallow workings.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: ____

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.												

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes____, No X , Name(s): Goodrich Gulch is approx. 1/4 mile below the mine.

Dry streambeds: Yes____, No X , Name(s):

Other surface water: Yes____, No X , Name(s)/Description:

Waste materials within any floodplain: Yes____, No X Source ID(s):

Approximate Flood frequency?___1 yr,___10 yr,___100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A
High Flow:__________, Average Flow:__________

Distance between waste source(s) and nearest surface water body (ft)? 1/4 mile

Surface water draining onto or through waste sources: Yes____, No X ,
Describe:

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
N/A

Observed erosional/sedimentation/stream turbidity problems? Yes_____, No X , Distance downstream (ft)?________ Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):
N/A

SURFACE WATER INVENTORY FORM

SAMPLERS: ____________________

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.											

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________________

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? N/A

Wetlands present: Yes___, No X , Describe:

Carbonate rocks/soils: Yes X , No___, Describe: Limestone is present in the vicinity.

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30 X ; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence(ft or miles)? Approximately 3 miles

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Bullock

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	None	Dry	150	120	Yes	Low
WR-2	None	Dry	200	190	Yes	Low
WR-3	None	Dry	5,000	4,500	Yes	Low
WR-4	None	Dry	500	600	No	None
WR-5	None	Dry	1,500	1,050	Yes	None

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No_X_, Describe:________________

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments None

Evidence of recreational use on site: Yes___, No_X_, Describe:________

Accessibility - Fences, warning signs, closed roads? Road closure in the drainage below the site.

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment________
Wilderness Area - Yes___, No_X_, Comment________
T&E Species Habitat - Yes___, No_X_, Comment________
Bat Habitat - Yes_X_, No___, Comment Many open adits

Primary Drainage___; Secondary Drainage_X_; No Information___:

Riparian Habitat Quality - High___, Medium___, Low Not Rated
Wetlands Frontage - High___, Medium___, Low Not Rated
Fisheries Habitat and Species Classification - Not Rated
Sport Fishery Classification - Not Rated

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number 20, types and locations: Adits scattered over the site.

Hazardous structures: Yes_X_, No___, Number 11, types and locations: Cabin and shop buildings scattered over the site. Many are in poor repair.

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____, types and locations:________

Unstable waste piles, impoundments, undercut banks: Yes_X_, No____, Number 3, types and locations: WR-2, WR-3, WR-5 are eroding slightly.

Fire and/or Explosion hazards: Yes_X_, No___, Explain: Cabins

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Eleanora Mines (East), Prepared by Northern Engineering and Testing, October 7, 1988.

USGS, Mining Districts of the Dillon Quadrangle, Montana, and Adjacent Areas, Bulletin 574, Written by Alexander N. Winchell, 1914.

USGS, Topographic Map, Old Baldy Mountain, Montana, 7 1/2 minute Quadrangle, 1989.

LABORATORY ANALYTICAL DATA

ELEANORA MINES (EAST)
PA NO. 29-285

Eleanor East PA# 29-285
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BULLOCK
INVESTIGATION DATE: 09/04/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-285-WR-1	25.3 J	140 J	1 U	12.4	3.15	34	12600 J	0.185 J	921	26 J	236 J	6.06 UJ	200 J	NR
29-285-WR-2	114 J	132 J	21	24.3	17.2	657	46700 J	1.13 J	3160	50 J	5330 J	4.75 UJ	4650 J	NR
BACKGROUND	25 J	260 J	1.1	6.9 JX	19.9 JX	32.4 J	15900 J	0.246	935 J	18 J	16	8 UJ	105 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
29-285-WR-1	0.02	0.62	6.23	5.6	0.01	<0.01	0.01	0	6.23
29-285-WR-2	0.36	11.2	31.5	20.3	0.22	0.05	0.09	1.56	30

LEGEND

WR1 -	Composite of subsamples WR1 and 4.
WR2 -	Composite of subsamples WR2, 3, and 5.
BACKGROUND -	From the Dry Gulch South (29-282-SS-1).

XRF ANALYSIS RESULTS

ELEANORA MINES (EAST)
PA NO. 29-285

Mine Name: Eleanor East PA# 29–285
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
29–285–WR–1		41473.5	2814.69	2743.16		1496.65	22105.7			257.072		51.5353
29–285–WR–1–COMP		49803.8	2791.76	3278.05		1068.5	28581.6			137.648		46.1982
29–285–WR–2		34401.2	5102.78	1544.38	191.764 *	2080.35	69232		1201.85	3589.03		156.886
29–285–WR–2–COMP		32033	10032.2	2295.58		4952.08	71544.7		781.466	4747.52		109.982
29–285–WR–3		25020.7	4679.25	2728.66		7244.37	85372		1162.91	9598.71		81.6387
29–285–WR–4		54050.2	2688.2	3515.39		965.149 *	34525.5			120.684 *		34.2216
29–285–WR–5		28221.4	16327.4	2574.11	192.739 *	2970.41	44705.6		95.446 *	736.519		94.4173

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
29–285–WR–1	231.572		4.85693 *	282.872	225.548			345.405			13.1271 *
29–285–WR–1–COMP	272.497			96.864	251.182			476.096		14.4396 *	10.4858 *
29–285–WR–2	59.7819		5.73373 *	4650.85	154			346.526			
29–285–WR–2–COMP	120.73			3974.65	158.678			301.467			
29–285–WR–3	94.7386			4442.13	138.865			197.246		10.3689 *	
29–285–WR–4	179.852			36.5228 *	280.563			474.819			12.1327 *
29–285–WR–5	129.102			1517.27	134.219			251.732			9.32654 *

* – Estimated Quantity
$ – Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

ELEANOR EAST
PA NO. 29-285

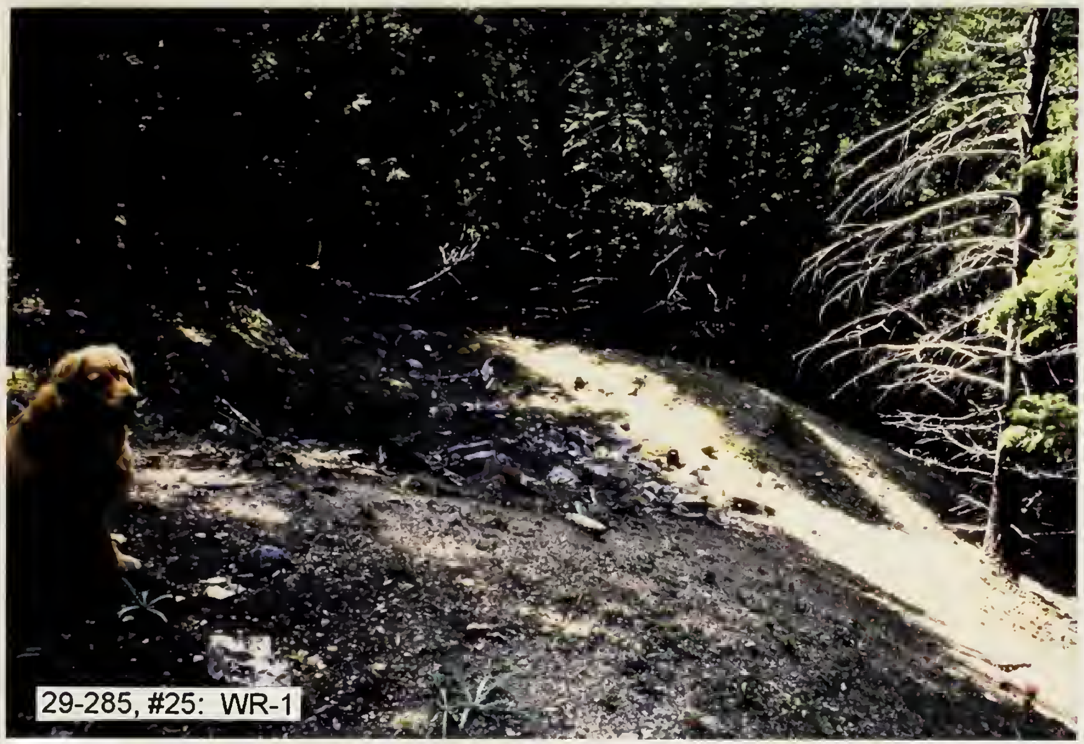
AIMSS SCORESHEET

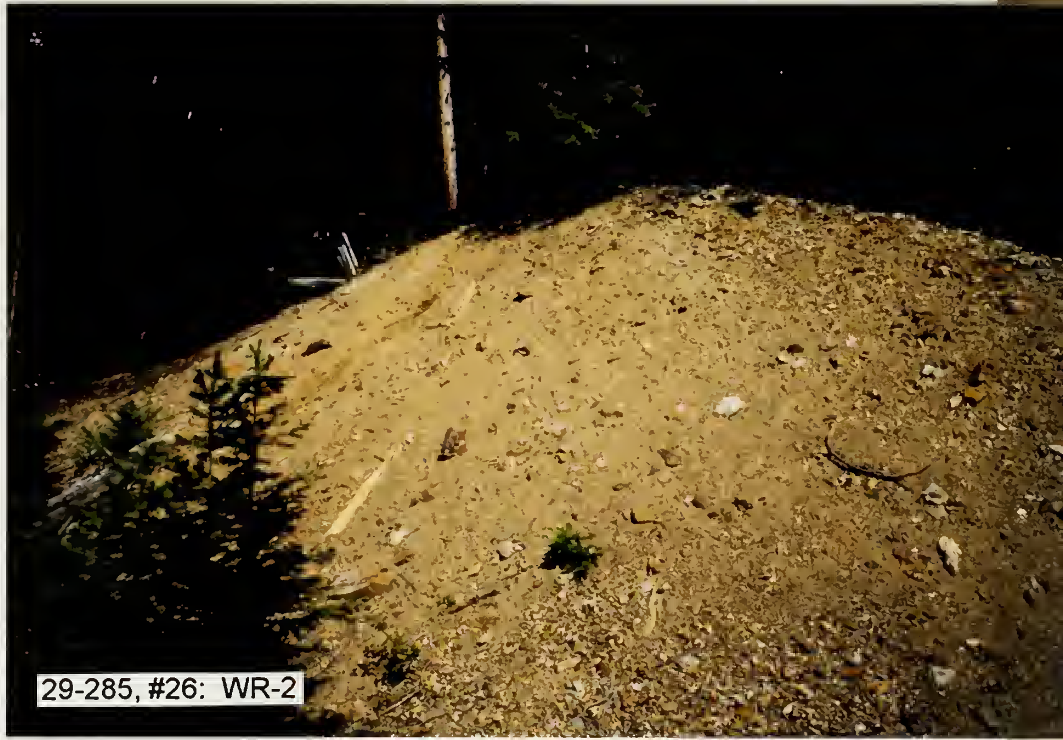
SITE NAME: ELEANOR MINES (EAST)
PA NUMBER: 29-285

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		2
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	40
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	40
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.645
6	GW - TARGETS	WELLS - 1 MI. x 2.5		0.0
7		WELLS - 1 TO 4 MI		20
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	20.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	1316
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	40
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	40
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.818
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		0
19		FISHERY		0
20		RECREATION		0
21		IRRIGATION/STOCK		0
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	0
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	0
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.061
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31		WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	10
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	31
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		0
37A		ACCESSIBILITY		10
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	50
38		LIKELIHOOD SCORE	LINES 36 + 37C	50
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.055
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		0
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 THRU 42	0
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	0
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000			**0.01**

SITE NAME: ELEANOR MINES (EAST)
PA NUMBER: 29-285

LINE NO.		SITE SAFETY		
1	THREAT	ACCESSIBILITY		10
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	1000
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	440
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	1440
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 THRU 11	0
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**0.00**


29-285, #25: WR-1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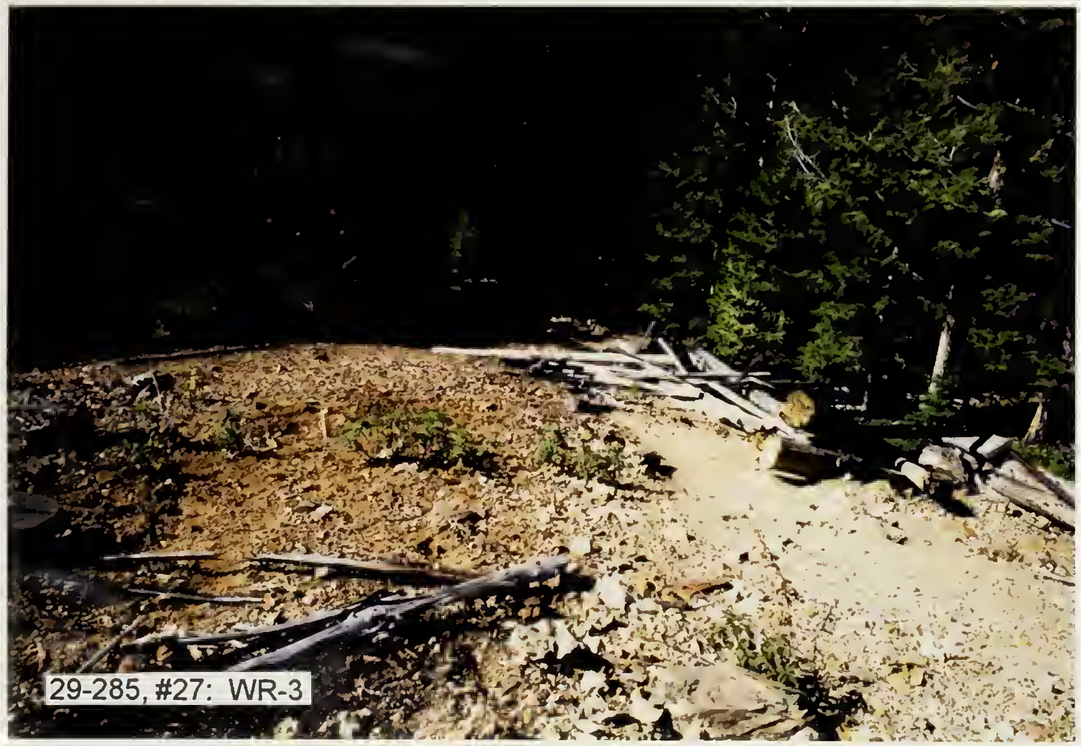
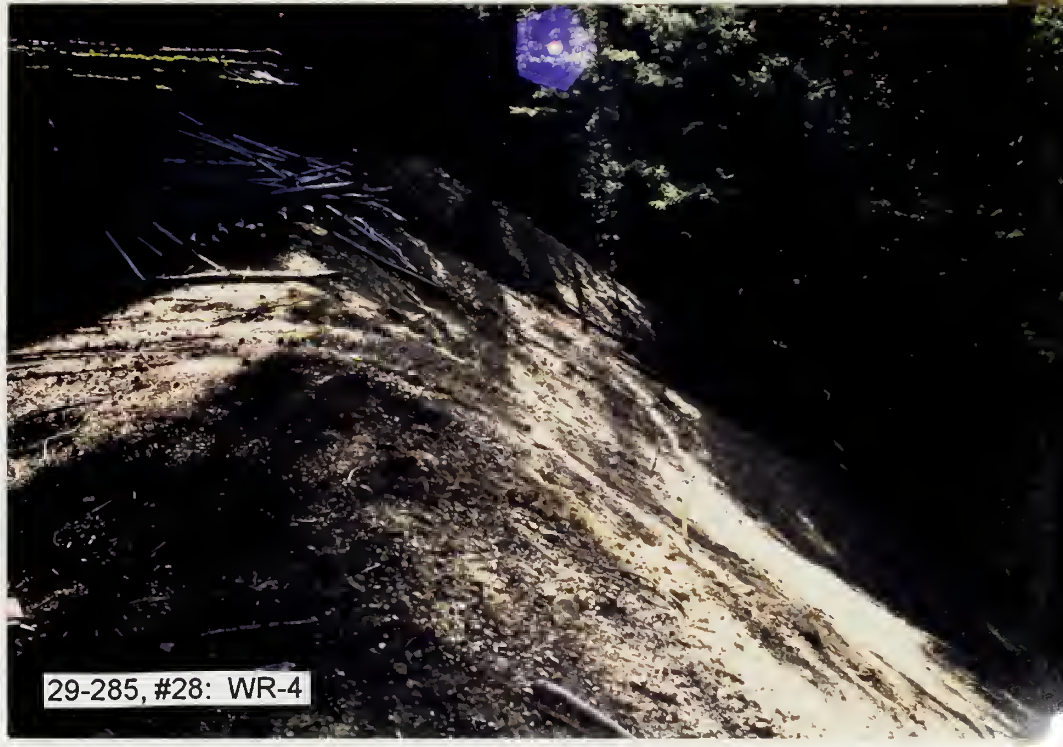

29-285, #27: WR-3


29-285, #28: WR-4

29-285, #29: WR-5

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: PETE & JOE PA#: 29-449

Date: July 23, 1993 Time: 1220

Field Team Leader: Babits, Pioneer

Sampling Personnel: Pierson, TD&H
Lasher, Pioneer

Visitors: Unidentified Forester

Weather/Seasonality Observations: Cool (50°-55°F); slight rain; slight breeze (5 mph); cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #15: Overview of mine. No video was taken.

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Recontour, cover with soil, and revegetate waste rock. May need to treat low pH adit discharge although there are no exceedances of Maximum Contaminant Levels.

MDSL AMRB/PIONEER 4/9/93

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): PETE & JOE PA#: 29-449

Legal Description: T 3S ;R 4W ;Sec. 8 , SW1/4 NW1/4 ___1/4

County: MADISON Mining District: TIDAL WAVE

Latitude: N 45° 35' 30" Longitude: W 112° 07' 40"

Primary Drainage Basin and Code: Currant Creek/10020005
Secondary Drainage Basin: Bear Gulch

USGS Quadrangle map name(s): Old Baldy Mountain

Mine Type/Commodities: Hardrock/Silver, Gold, Lead, Copper

Activity Status: Active___,Inactive/Exploration___,Abandoned X .

Ownership status: Known YX N__; private/public? Private/Public
Owner, Agent, or Contact(Include address and phone when available): Montana Platinum Corp., Gold Ranch Mining Corp., Drawer J, Twin Bridges, MT 59754. (406) 684-5723; Deerlodge National Forest.

Relationship to other mines/sites in the area/district: Located 1/2 mile from the B & H mine.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation 9200', Slope 35°,
Aspect West

Land use: Mining X , Recreational X , Residential___, Urban___,
Agricultural___, Other(Specify)

Area of disturbed/unvegetated lands? 0.6 acres.
Dimensions:

Predominant vegetation types: Pine, fir, grouse whortleberry

Access: roads - good___,poor___,4wd X ,trail X .
Other logistical considerations (proximity to other sites).
Locked gate at B&H mine

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site lies on a hillside above and northeast of an unnamed tributary of headwaters of Bear Gulch. Water leaving the site would flow southwest to west off site to tributary and then north and west in Bear Gulch. Bear Gulch flows into Reids Ditch/Currant Creek approx. 6.5 to 7 miles below the site. Springs are downgradient of WR-1. The site is underlain by Paleozoic limestones resting upon quartzites, schists, and gneisses.

Mining/milling history, ore type/tenor, host rock, gangue: Operated from the 1860's to unknown. Deposits consist of stringers of pyrite and galena with pockets of high grade gold ore. A small amount of chalcopyrite and sphalerite is present.

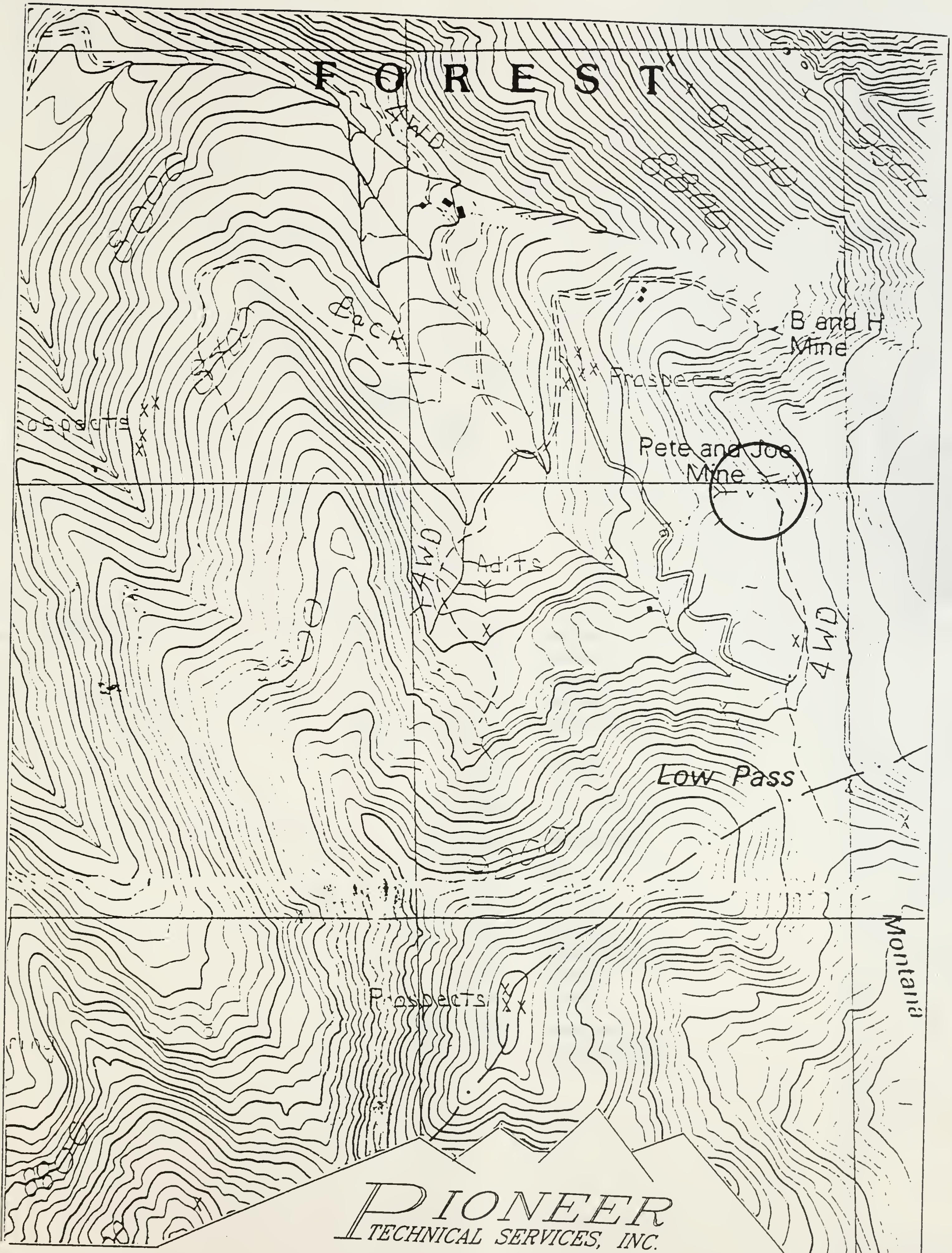
Mine Operation?
Shafts - Yes___, No X , # ____, Comment____
Adits - Yes X , No___, # 3 , Comment Open; 1 with gate
Pits - Yes___, No X , # ____, Comment____
Placers - Yes___, No X , # ____, Comment____
Other - Yes___, No X , # ____, Comment____

Mill Operation? Yes____, No X . If yes answer the next three questions:

Period(s) of Operation: N/A

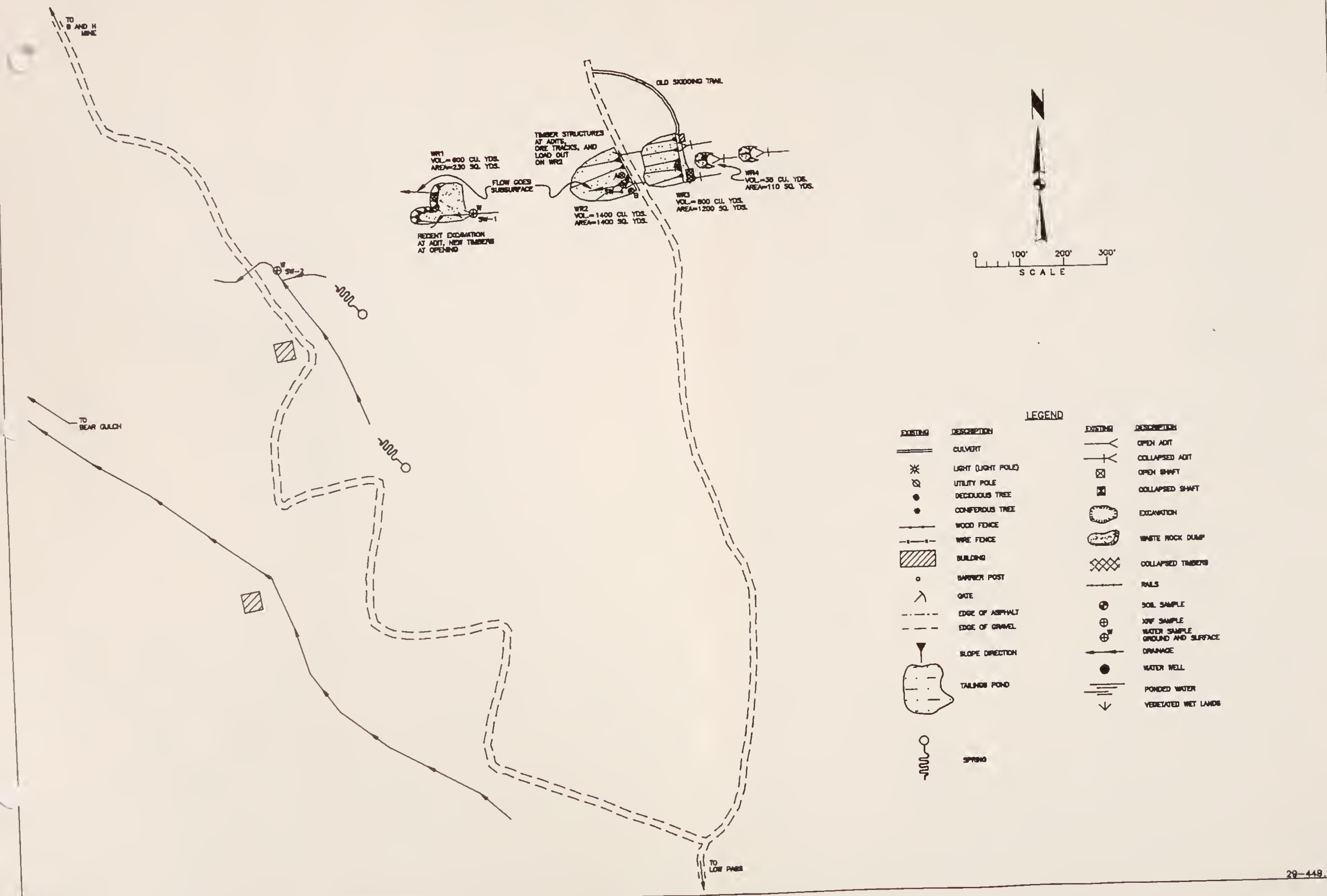
Origin of Ore Milled - Custom Mill___ Dedicated Mill___; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN^- leach (vat, heap), floatation, smelting?
N/A



PIONEER
TECHNICAL SERVICES, INC.

PETE & JOE, P.A. NO. 29-449
T03S, R04W, SECTION 08



DRAWN JTP DATE 23 OCT 93
DESIGNED TPR JOB NO. 93-17
APPROVED WJB F.B. NO.

PIONEER TECHNICAL SERVICES, INC. BUTTE, MT.

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS–BOZEMAN–KALISPELL MONTANA
SPOKANE WASHINGTON

TD&H

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

PETE AND JOE PA# 29–449
TIDAL WAVE DISTRICT MADISON COUNTY

SHEET NO.

29–449.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1	WR	600	Northwest side of dump	None	5.6 (D)	0.06	29-449-WR-1	07/23/93 1930	T-Metals, ABA
WR-2A	WR	1,400	Top and center of dump	None	5.6 (D)	0.04			
WR-2B	WR		Top and south side of dump	None	5.8 (D)	0.04			
WR-3	WR	800	Top and center of dump	None	5.8 (D)	0.05			
WR-4	WR	35	Top and center of dump	None	6.6 (D)	0.05			

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 29-449-WR-1 is composite of WR-1, WR-2A and -2B, WR-3 and WR-4. See Lakeshore mine for background soil.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X , No ___, Number: 2 Identification: At WR-1 and WR-2

Filled shafts: Yes___, No X , Number:____ Identification:____

Seeps/Springs: Yes X , No___, Number: 2 Identification: Below WR-1

Groundwater wells within 4 miles?: Yes X , No___;
Number of well logs: 1

Distance to nearest well used for drinking? Approx. 4 miles

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible X , Unlikely____.
Uncontained sources containing slightly elevated metal values; shallo groundwater.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: Babits

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	AD	Discharging adit at WR-1	20 gpm (E)	7.6	NM	335	3.7	87	N/A	29-449-SW-1	07/23/93 1330	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SW-4	AD	Discharge adit at WR-2	10 gpm (E)	5.13	NM	147	4.0	0	N/A	N/A	N/A	Field Parameters

*FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): NM = Not Measured

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes_X__, No___, Name(s):__Springs

Dry streambeds: Yes____, No_X_, Name(s):

Other surface water: Yes____, No_X_, Name(s)/Description:

Waste materials within any floodplain: Yes____, No_X_ Source ID(s):_

Approximate Flood frequency?___1 yr,___10 yr,___100 yr

Estimated seasonal flow of stream(s) (cfs)? 100 gpm (springs together)
High Flow: 750 gpm , Average Flow: 150 gpm

Distance between waste source(s) and nearest surface water body (ft)?_
200 feet

Surface water draining onto or through waste sources: Yes____, No_X__,
Describe:

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Fishery, irrigation, wetland

Observed erosional/sedimentation/stream turbidity problems? Yes____,
No_X__, Distance downstream (ft)?________ Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):________
None observed during investigation.

SURFACE WATER INVENTORY FORM

SAMPLERS: Babits

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-2	SW	Spring	7.86	NM	183	4.7	22	100 gpm (E)	N/A	N/A	Field Parameters

*FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): NM = Not Measured

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 5 to 10 acres

Wetlands present: Yes X , No ____, Describe: Boggy areas around the springs

Carbonate rocks/soils: Yes X , No ___, Describe: Limestone

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30 X ; 30-100___; 100-300____; 300-1,000____; 1,000-3,000____; 3,000-10,000____; 10,000 or greater___; Comments

Nearest residence(ft or miles)? Approx. 4 miles

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits, Lasher, Pierson

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	SO3	Moist	2,070	2,070	Yes	Moderate/Low
WR-2	SO3	Moist	12,600	12,600	Yes	Moderate/Low
WR-3	SO3	Moist	10,800	10,800	Yes	Moderate/Low
WR-4	SO3	Moist	990	990	Yes	Moderate/Low
SW	FEOX	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No_X_, Describe:____

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments_None_______________________________________

Evidence of recreational use on site: Yes___, No_X_, Describe:_______
____

Accessibility - Fences, warning signs, closed roads?_Must walk from B&H mine____

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment________________
Wilderness Area - Yes___, No_X_, Comment________________
T&E Species Habitat - Yes___, No_X_, Comment________________
Bat Habitat - Yes_X_, No___, Comment_Adits____________

Primary Drainage___; Secondary Drainage___; No Information_X_:

Riparian Habitat Quality - High___, Medium___, Low___
Wetlands Frontage - High___, Medium___, Low___
Fisheries Habitat and Species Classification - ___
Sport Fishery Classification - ___

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_3_, types and locations:___
Adits at WR-1 and WR-2____
____

Hazardous structures: Yes___, No_X_, Number____, types and locations:_
____
____

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____, types and locations:____
____
____

Unstable waste piles, impoundments, undercut banks: Yes____, No_X_, Number____, types and locations:_______________________________
____
____

Fire and/or Explosion hazards: Yes___, No_X_, Explain:________________
____
____

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Pete & Joe, Prepared by Chen-Northern, October 12, 1985.

USGS, Mining Districts of the Dillon Quadrangle, Montana and Adjacent Areas, Bulletin 574, Written by Alexander N. Winchell, 1914.

USGS, Topographic Map, Old Baldy Mountain, Montana, 7 1/2 minute Quadrangle, 1989.

LABORATORY ANALYTICAL DATA

PETE & JOE
PA NO. 29-449

Pete & Joe PA# 29-449
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BABITS
INVESTIGATION DATE: 07/23/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-449-WR-1	152	133 J	2.3	6.5 J	35.6	222 J	41900	1.18 J	423	20 J	216 J	7 U	135 J	NR
BACKGROUND	103	94	1.8	19.8	100	57.4	34300	1.23 J	606 J	61.4	31.9	16.9	70.6	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
29-449-WR-1	1.03	32.2	3.2	-29	0.67	0.16	0.2	5	-1.8

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-449-SW-1	1.23	11.6 JX	2.57 U	9.7 U	6.83 U	1.55 U	168 J	0.038 U	66.6	12.7 U	0.72 U	30.7 U	16 J	157

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-449-SW-1	240	< 5.0	75	< 0.05	NR

LEGEND

WR1 - Composite of subsamples WR1, 2A, 2B, 3, and 4.
BACKGROUND - From the Lakeshore Mine (29-436-SS-1).
SW1 - Discharge from adit at waste rock dump 1.

XRF ANALYSIS RESULTS

PETE & JOE
PA NO. 29-449

Mine Name: Pete & Joe PA# 29-449
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
29-449-WR2-A		33590.9	1285.19	981.021	136.098 *		36672		80.601 *	65.2104 *	182.98 *	965.016
29-449-WR2-B		23925	4286	1756.32		1277.1	56957.8		250.991	198.4	143.293 *	277.965
29-449-WR-1		37780.9	20248.7	1730.97		1397.03	54544.5		109.944 *	69.0405 *	165.57	286.589
29-449-WR-1-COMP		29005.7	4909.72	1876.73		569.481 *	59439.5		242.621	107.04 *	190.46	238.331
29-449-WR-3		24061.3	6145.12	2290.93		417.242 *	76973.4		285.317	169.154 *	276.982	364.734
29-449-WR-4		31636.1	1756.3	2181.19	198.112 *	549.136 *	95956.5		429.162	136.315 *	286.432	51.6482

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
29-449-WR2-A	144.277		102.195	410.649	168.115		44.3172 *	338.769	113.352 *		27.886 *
29-449-WR2-B	124.684		19.3061	139.929	146.479			579.951	116.943 *	12.6887 *	14.2989 *
29-449-WR-1	125.459			113.783	179.781			469.819			12.2428 *
29-449-WR-1-COMP	132.643		17.8831 *	180.841	150.851			493.484	167.358 *	16.3485 *	13.5554 *
29-449-WR-3	133.493			202.939	144.511			813.454	137.664 *	13.4709 *	16.9177 *
29-449-WR-4	94.4864			66.2678 *	149.499			262.317	126.617 *		11.1988 *

* – Estimated Quantity
$ – Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

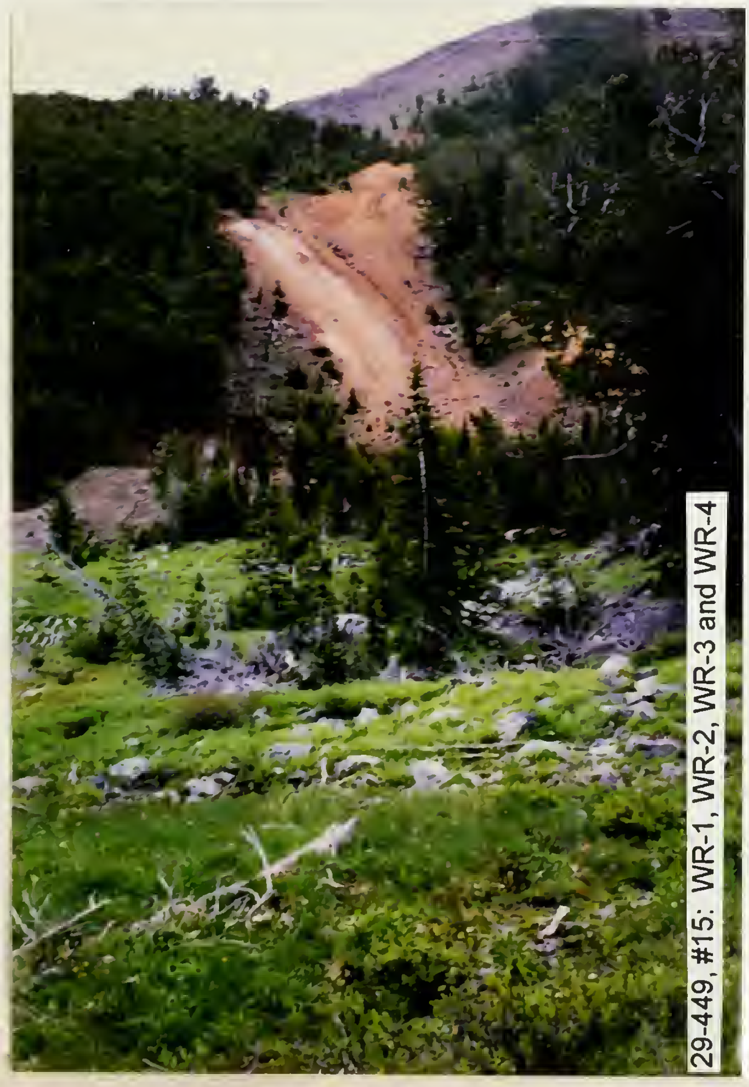
PETE & JOE
PA NO. 29-449

AIMSS SCORESHEET

SITE NAME: PETE & JOE
PA NUMBER: 29-449

LINE NO.				
		GROUNDWATER PATHWAY		
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.734
6		WELLS - 1 MI. x 2.5		0.0
7	GW - TARGETS	WELLS - 1 TO 4 MI		1
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	1.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	294
		SURFACE WATER PATHWAY		
11		OBSERVED RELEASE		0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	40
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	40
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.862
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19	SW - TARGETS	FISHERY		0
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	17
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	586
		AIR PATHWAY		
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		15
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	75
27		LIKELIHOOD SCORE	LINES 25 + 26C	75
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.026
29		POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	10
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	20
		DIRECT CONTACT PATHWAY		
36		OBSERVED EXPOSURE		0
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		5
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	25
38		LIKELIHOOD SCORE	LINES 36 + 37C	25
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.023
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		0
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 THRU 42	0
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	0
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE**	(LINES 10 + 24 + 35 + 44) / 100,000		**0.01**

LINE NO.		**SITE SAFETY**	**SITE NAME:** **PA NUMBER:**	PETE & JOE 29-449
1	THREAT	ACCESSIBILITY		5
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	150
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	150
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 THRU 11	0
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**0.00**



29-449, #15: WR-1, WR-2, WR-3 and WR-4

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: OHIO PA#: 29-473

Date: July 20, 1993 Time: 1500-1730

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: Belanger, Pioneer
Clark, Pioneer

Visitors: None

Weather/Seasonality Observations: Rain; cool; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #1: WR-1 (south dump); #2: WR-2; #3-#6: WR-3 (reclaimed). No video was taken.

General Comments/Observations (not covered specifically in attached Inventory Forms): Access by truck, but difficult to find access; access from Silver Star or Waterloo.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Mostly reclaimed; revegetate remaining dumps and fill pit in with dump material.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): OHIO PA#: 29-473

Legal Description: T 2S ;R 5W ;Sec. 25 , SE1/4NE 1/4 1/4

County: MADISON Mining District: TIDAL WAVE

Latitude: N 45° 38' 05" Longitude: W 112° 09' 25"

Primary Drainage Basin and Code: Jefferson River/10020005
Secondary Drainage Basin: Hellroaring Canyon

USGS Quadrangle map name(s): Waterloo

Mine Type/Commodities: Hardrock/Gold

Activity Status: Active___,Inactive/Exploration X ,Abandoned___.

Ownership status: Known YX N__; private/public? Public
Owner, Agent, or Contact(Include address and phone when available): Deerlodge National Forest

Relationship to other mines/sites in the area/district: None

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? WR-3 has been reclaimed.

General site features: Elevation 7450', Slope 30°-40°,
Aspect West

Land use: Mining___, Recreational X , Residential___, Urban___,
Agricultural___, Other(Specify)

Area of disturbed/unvegetated lands? 5 acres.
Dimensions: 300 feet x 400 feet

Predominant vegetation types: Douglas fir, White bark pine, talus

Access: roads - good X ,poor___,4wd X ,trail___.
Other logical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There is 1 well log within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Limestone; volcanics and on dumps. Site lies on north side of the dry Hellroaring Canyon, which would flow northwest away from the site during storm events.

Mining/milling history, ore type/tenor, host rock, gangue: No information available.

Mine Operation?
Shafts - Yes___, No X, # ___, Comment___
Adits - Yes X, No___, # 5, Comment Caved
Pits - Yes X, No___, # 1, Comment Possibly a caved adit
Placers - Yes___, No X, # ___, Comment___
Other - Yes___, No X, # ___, Comment___

Mill Operation? Yes___, No X. If yes answer the next three questions:

Period(s) of Operation: N/A

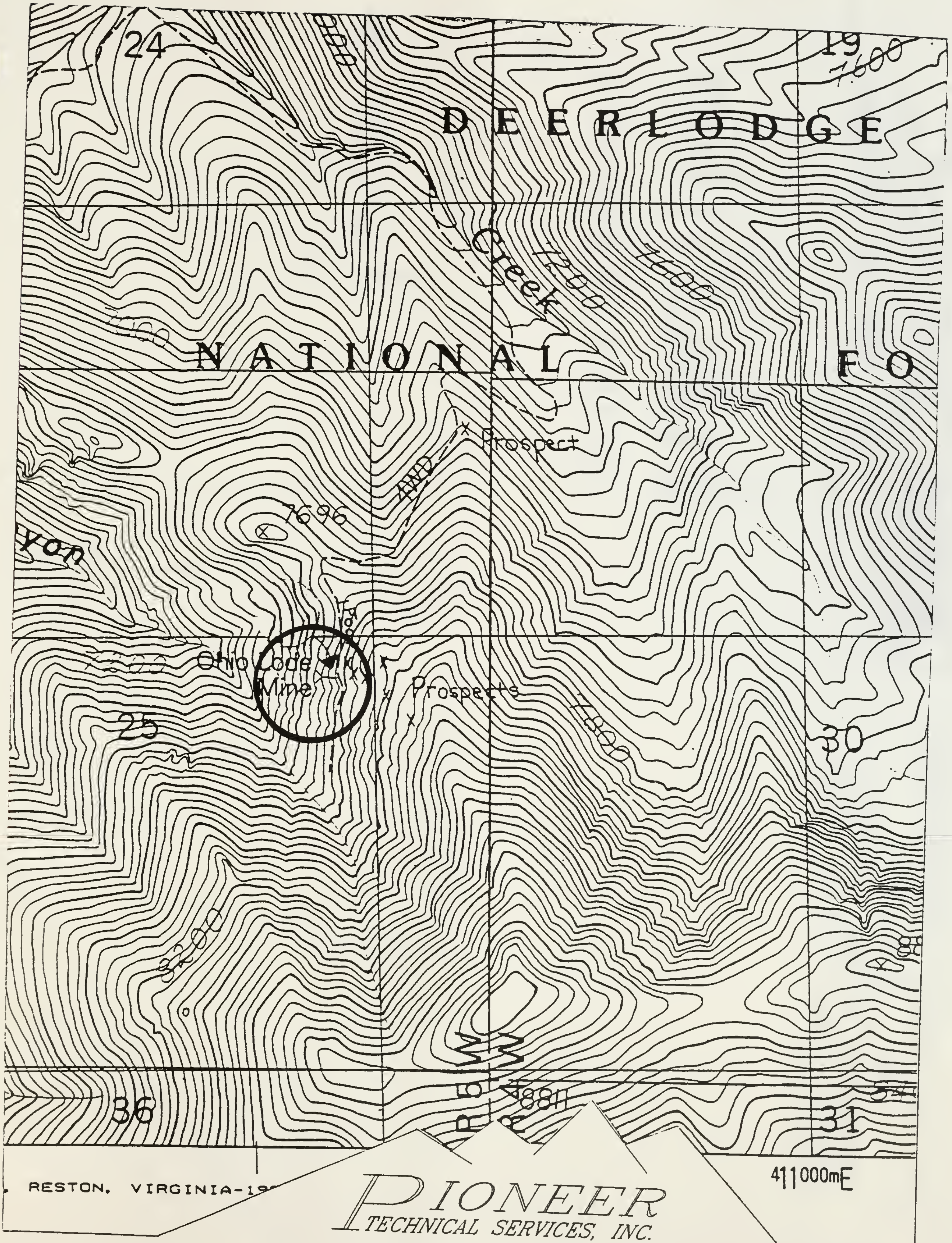
Origin of Ore Milled - Custom Mill___ Dedicated Mill___; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN^- leach (vat, heap), floatation, smelting?
N/A

Montana Bureau of Mines and Geology
Water Well Log Data

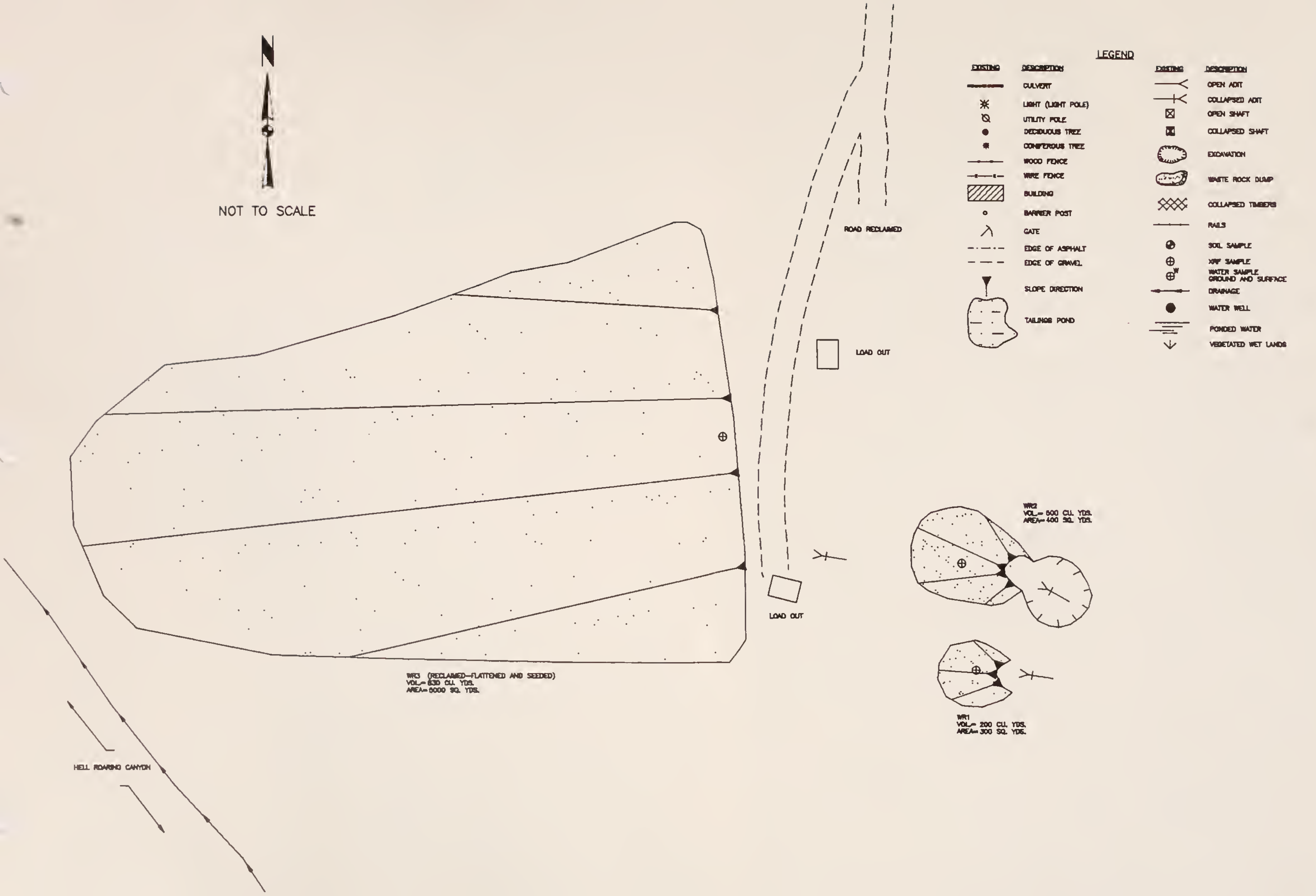
11/05/1993

Well No.	Location	Depth	Yield	Static Water Level
M 107345	02S 05W 35 DC	54.0	20.0	25.00



PIONEER
TECHNICAL SERVICES, INC.

OHIO, P.A. NO. 29-473
T02S, R05W, SECTION 25
SCALE: 1" = 1000'



DRAWN JTP DATE 22 OCT 93
DESIGNED TPR JOB NO. 93-17
APPROVED DT F.B. NO.

PIONEER TECHNICAL SERVICES, INC. BUTTE, MT.

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL MONTANA
SPOKANE WASHINGTON

TD&H

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY
OHIO PA# 29-473
TIDAL WAVE DISTRICT MADISON COUNTY

SHEET NO.

29-473.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Tuesday, Belanger

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1	WR	830	On WR-1 (southwest dump) at middle of slide	None	6.4 (D)	0.03	29-473-WR-1	07/20/93 2200	T-Metals, ABA
WR-2	WR	500	On WR-2 in west middle section	None	6.2 (D)	0.06			
WR-3	WR	830	On reclaimed dump	Reclaimed	6.5 (D)	0.04			

*D-Direct reading(Kelvey Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 29-473-WR-1 is composite of WR-1, -2, and -3. WR-3 has been smoothed and reclaimed.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map oı topographic map.

Flowing adits: Yes___, No X , Number:____ Identification:______________

Filled shafts: Yes___, No X , Number:____ Identification:______________

Seeps/Springs: Yes___, No X , Number:____ Identification:______________

Groundwater wells within 4 miles?: Yes X , No___;
Number of well logs: 10

Distance to nearest well used for drinking? > 4 miles

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible____, Unlikely X .
Metal values in dumps is low; high pH in dump soils; no water on or near site.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: ____

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.												

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____

MDSL AMRB/PIONEER 4/9/93

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes____, No X , Name(s):

Dry streambeds: Yes X , No___, Name(s): Hellroaring Canyon (may have running water during storms)

Other surface water: Yes____, No X , Name(s)/Description:

Waste materials within any floodplain: Yes____, No X Source ID(s):

Approximate Flood frequency?___1 yr,___10 yr,___100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A
High Flow:__________, Average Flow:__________

Distance between waste source(s) and nearest surface water body (ft)?
50 feet from toe of dump to Hellroaring Canyon.

Surface water draining onto or through waste sources: Yes____, No X ,
Describe:

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Hellroaring Canyon ends in valley 3.5 miles downstream; discharge into ground.

Observed erosional/sedimentation/stream turbidity problems? Yes_____, No X , Distance downstream (ft)?________ Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):

SURFACE WATER INVENTORY FORM

SAMPLERS: ____

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.											

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? (SO_3)

Presence of evaporative salt deposits? (ESD)

Discolored or turbid seepage? (SPG)

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? (FEOX)

Presence of burned or stressed vegetation? (VEG)

pH ≤ 5.0 (pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? None; too steep

Wetlands present: Yes___, No_X_, Describe:

Carbonate rocks/soils: Yes_X_, No___, Describe: Limestone on dumps

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10_X_; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence(ft or miles)? > 4 miles (White Rock Ranch)

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Tuesday, Belanger

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	FEOX	Dry	2,700	2,160	Yes	Low
WR-2	FEOX	Dry	3,600	3,240	Yes	Low
WR-3	FEOX	Dry	45,000	18,000	Yes	Low

Notes and Clarifications: WR-3 has been regraded and revegetated.

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No X, Describe:____

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments None

Evidence of recreational use on site: Yes___, No X, Describe:____

Accessibility - Fences, warning signs, closed roads? Access through private land

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No X, Comment____
Wilderness Area - Yes___, No X, Comment____
T&E Species Habitat - Yes___, No X, Comment____
Bat Habitat - Yes___, No X, Comment____

Primary Drainage___; Secondary Drainage X; No Information___:

Riparian Habitat Quality - High___, Medium___, Low X
Wetlands Frontage - High___, Medium___, Low X
Fisheries Habitat and Species Classification - Not Rated
Sport Fishery Classification - Not Rated

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes___, No X, Number____, types and locations: Adits are all caved.

Hazardous structures: Yes X, No___, Number 1, types and locations: Two loadouts are present, but only one may be hazardous.

Unstable highwalls, pits, trenches, slopes: Yes___, No X, Number____, types and locations: One pit is present, but is not unstable.

Unstable waste piles, impoundments, undercut banks: Yes____, No X, Number____, types and locations:____

Fire and/or Explosion hazards: Yes___, No X, Explain:____

Bibliography

MBMG, Mineral and Industry File 90.0, Ohio Claim, Whitehall (Renova) District, Madison County, Montana.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Ohio Lode, Prepared by Chen-Northern, October 20, 1989.

USGS, Topographic Map, Waterloo, Montana, 7 1/2 minute Quadrangle, 1989.

LABORATORY ANALYTICAL DATA

OHIO
PA NO. 29-473

Ohio PA# 29-473
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - TUESDAY
INVESTIGATION DATE: 07/20/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-473-WR-1	36 J	205 J	3.3	5.1 JX	10.4 JX	126 J	14200 J	0.797	1790 J	14 J	322	12 J	701 JX	NR
BACKGROUND	25 J	260 J	1.1	6.9 JX	19.9 JX	32.4 J	15900 J	0.246	935 J	18 J	16	8 UJ	105 JX	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
29-473-WR-1	<0.01	0	295	295	<0.01	<0.01	0.02	0	295

LEGEND

WR1 - Composite of subsamples WR1, 2, and 3.
BACKGROUND - From the Dry Gulch South (29-282-SS-1).

XRF ANALYSIS RESULTS

OHIO
PA NO. 29-473

Mine Name: Ohio PA# 29-473
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
29-473-WR-1		8275.5	212418	1385.92		7465.27	15805.9		101.976 *	688.451		421.665
29-473-WR-1-COMP		21464.2	34874.2	2528.14	169.551 *	1389.08	46090.9		83.4553 *	308.373		135.467
29-473-WR-2	108 $	39300 $	9743 $	289 $		1558 $	34952 $	215 $	129 $	585 $	16 $	214 $
29-473-WR-3		49561.9	8718.75	1777.38		1293.1	33279.7		109.324 *	589.824		215.987

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
29-473-WR-1	76.179			380.711	45.7938 *			609.569		18.7263 *	16.3861 *
29-473-WR-1-COMP	108.386	52.6859 *		565.344	129.921			249.746			
29-473-WR-2	202 $	53 $		213 $	237 $		66 $	523 $	51 $	48 $	44 $
29-473-WR-3	205.71	47.0819 *		239.419	269.304			643.888		50.1273	40.7218

* – Estimated Quantity
$ – Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

OHIO
PA NO. 29-473

AIMSS SCORESHEET

SITE NAME: OHIO
PA NUMBER: 29-473

GROUNDWATER PATHWAY

LINE NO.				
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		2
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	40
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	40
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.324
6	GW - TARGETS	WELLS - 1 MI. x 2.5		2.5
7		WELLS - 1 TO 4 MI		9
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	11.5
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	149

SURFACE WATER PATHWAY

11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	400
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.357
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		0
19		FISHERY		0
20		RECREATION		0
21		IRRIGATION/STOCK		0
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	0
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	0

AIR PATHWAY

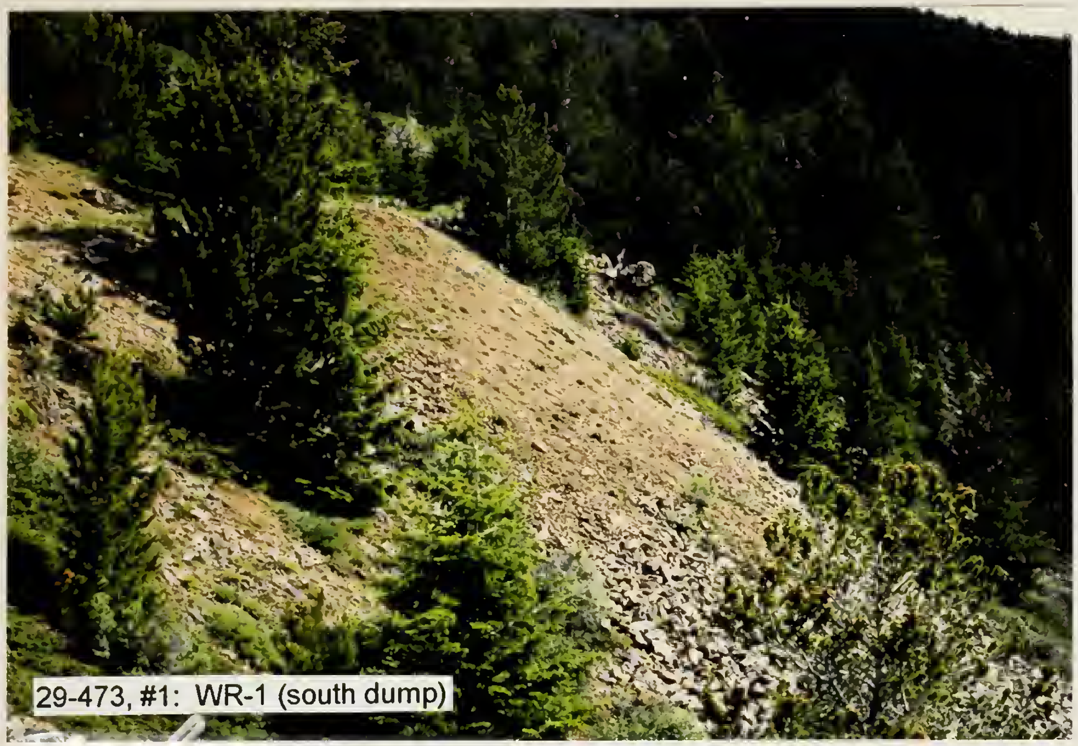
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.036
29	AIR - TARGETS	POPULATION - 4 MILES		1
30		NEAREST RESIDENCE		0
31		WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	1
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	2

DIRECT CONTACT PATHWAY

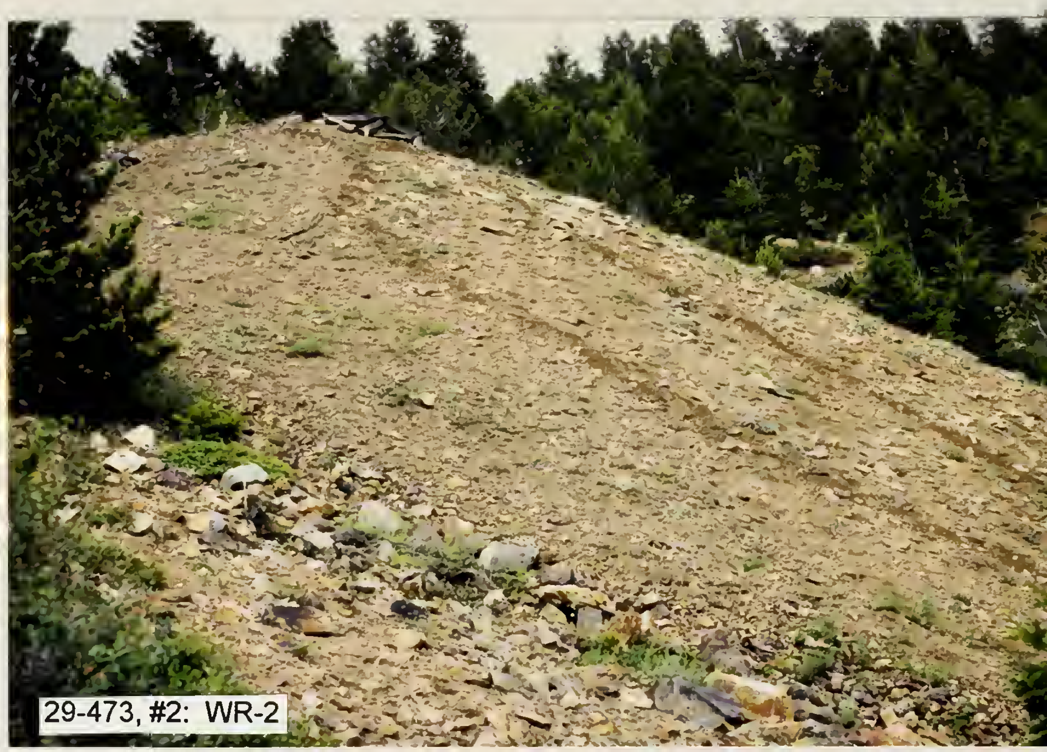
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		0
37A		ACCESSIBILITY		10
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	50
38		LIKELIHOOD SCORE	LINES 36 + 37C	50
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.032
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		0
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 THRU 42	0
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	0

45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000	**0.00**

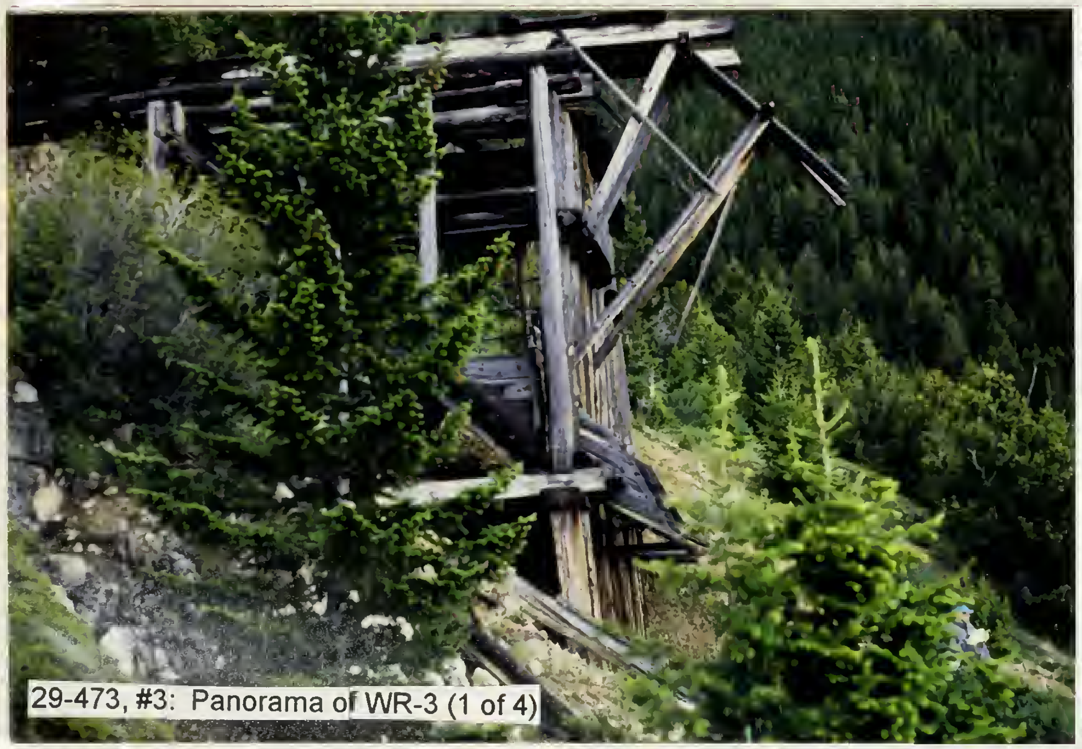
LINE NO.		SITE SAFETY	SITE NAME: PA NUMBER:	OHIO 29-473
1	THREAT	ACCESSIBILITY		10
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	40
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	40
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 THRU 11	0
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**0.00**



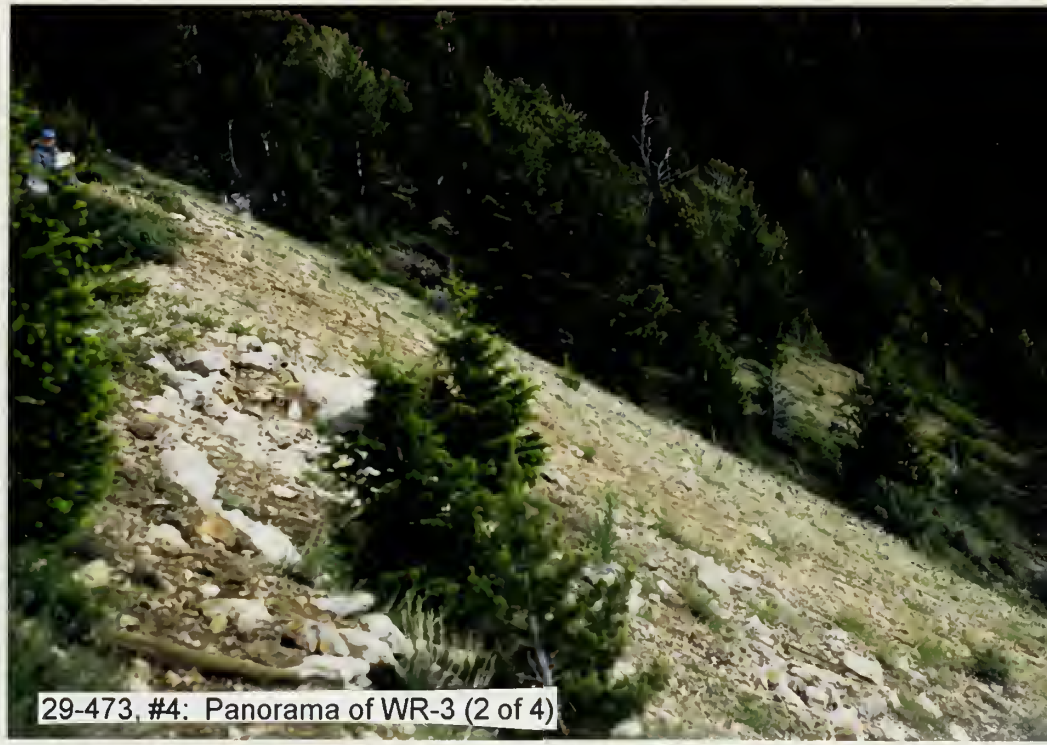
29-473, #1: WR-1 (south dump)



29-473, #2: WR-2



29-473, #3: Panorama of WR-3 (1 of 4)



29-473, #4: Panorama of WR-3 (2 of 4)

29-473, #5: Panorama of WR-3 (3 of 4)

29-473, #6: Panorama of WR-3 (4 of 4)

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: KEARSAGE PA#: 29-102

Date: July 20, 1993 Time: 1230

Field Team Leader: Babits, Pioneer

Sampling Personnel: Pierson, TD&H
Lasher, Pioneer

Visitors: Logger

Weather/Seasonality Observations: Warm (65°F); partly cloudy; slight breeze (5 mph); cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #5: Shaft at WR-1; #6: Mill Gulch, WR-1, and loadout. Video Tape No. 3

General Comments/Observations (not covered specifically in attached Inventory Forms): A mill was associated with the Kearsage site. The mill was located in Alder Gulch; late placer activity has altered the area.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Waste rock could be recontoured, coversoiled, and revegetated; should be bermed out of the creek.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): KEARSAGE PA#: 29-102

Legal Description: T 7S ;R 3W ;Sec. 23 , NW1/4 NE1/4 ___1/4

County: MADISON Mining District: VIRGINIA CITY

Latitude: N 45° 13' 00" Longitude: W 111° 56' 00"

Primary Drainage Basin and Code: Alder Gulch/10020003
Secondary Drainage Basin: Mill Gulch

USGS Quadrangle map name(s): Cirque Lake

Mine Type/Commodities: Hardrock/Gold

Activity Status: Active___,Inactive/Exploration X ,Abandoned___.

Ownership status: Known YX N__; private/public? Private
Owner, Agent, or Contact(Include address and phone when available): Hanover Gold Co., Inc., 14 Hewlett Drive, East Williston, NY 11590. (516) 742-1202.

Relationship to other mines/sites in the area/district: Many mines in the district.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? One shaft has been fenced.

General site features: Elevation 7200' , Slope 30° ,
Aspect Northeast

Land use: Mining___, Recreational___, Residential___, Urban___, Agricultural___, Other(Specify) Logging

Area of disturbed/unvegetated lands? 1 acres.
Dimensions:

Predominant vegetation types: Grouse whortleberry, pine, fir, grasses

Access: roads - good X ,poor___,4wd___,trail___.
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Mill Gulch flows west to east on the north side of the site to confluence with Alder Gulch approx. 1,000 feet east of the site. Site is underlain by gneiss and schist.

Mining/milling history, ore type/tenor, host rock, gangue: Operated from the 1860's to the early 1900's. In 1903, a 60-stamp mill equipped for amalgamation concentration and cyanidation was transferred from another mine. Country rock of gneiss and schist with ore in two veins; veins are composed of gangue of crushed feldspar or "clay" with abundant quartz and some chlorite, calcite, and auriferous pyrite. Ore minerals occur as pyrite, coarse native gold, and telluride of gold.

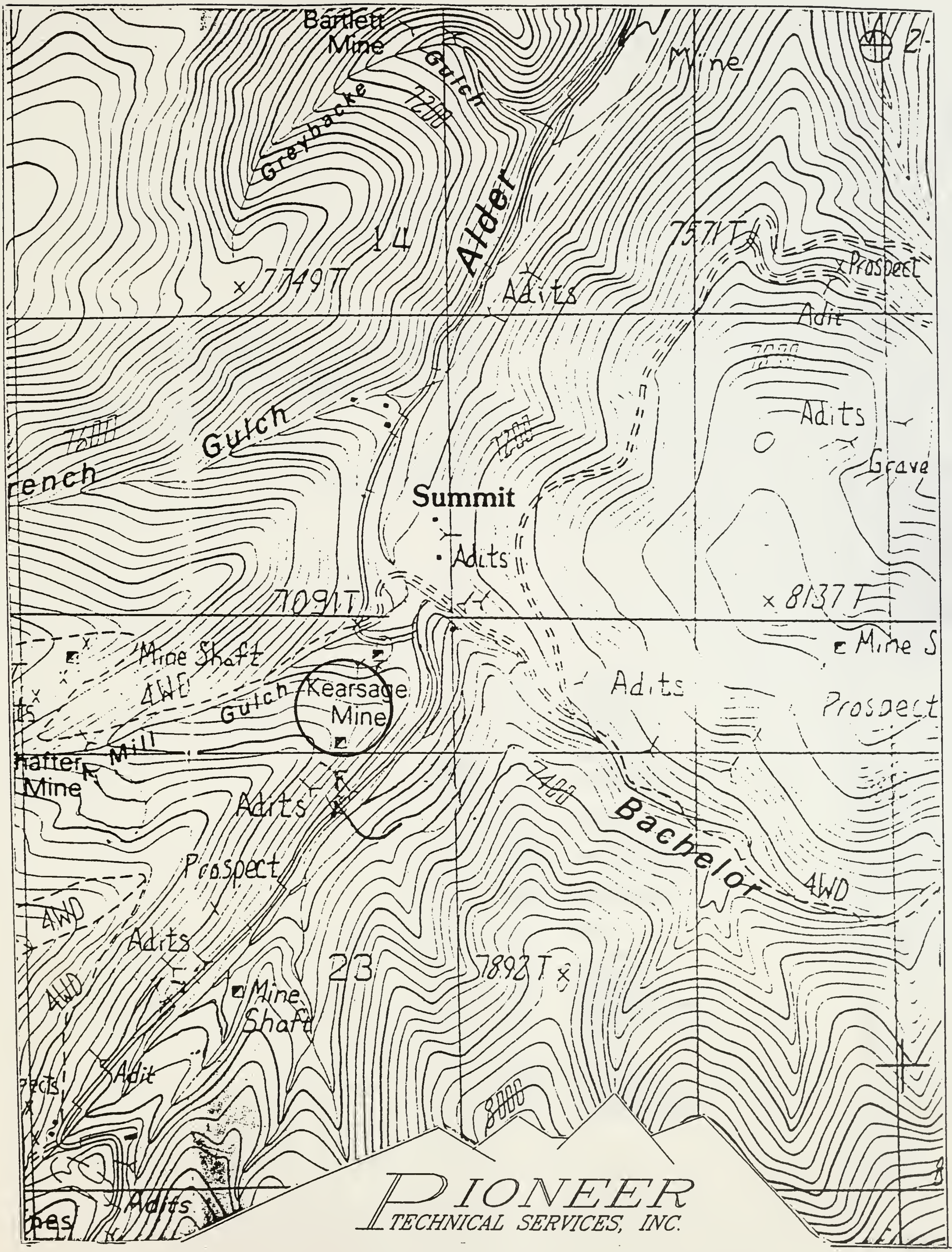
Mine Operation?
Shafts - Yes X, No ___, # 2, Comment 1 open
Adits - Yes X, No ___, # 4, Comment 1 open
Pits - Yes ___, No X, # ___, Comment ___
Placers - Yes ___, No X, # ___, Comment ___
Other - Yes ___, No X, # ___, Comment ___

Mill Operation? Yes ___, No X. If yes answer the next three questions:

Period(s) of Operation: 1903 to Unknown

Origin of Ore Milled - Custom Mill ___ Dedicated Mill ___; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN^- leach (vat, heap), floatation, smelting? 60-stamp mill equipped for amalgamation concentration and cyanidation

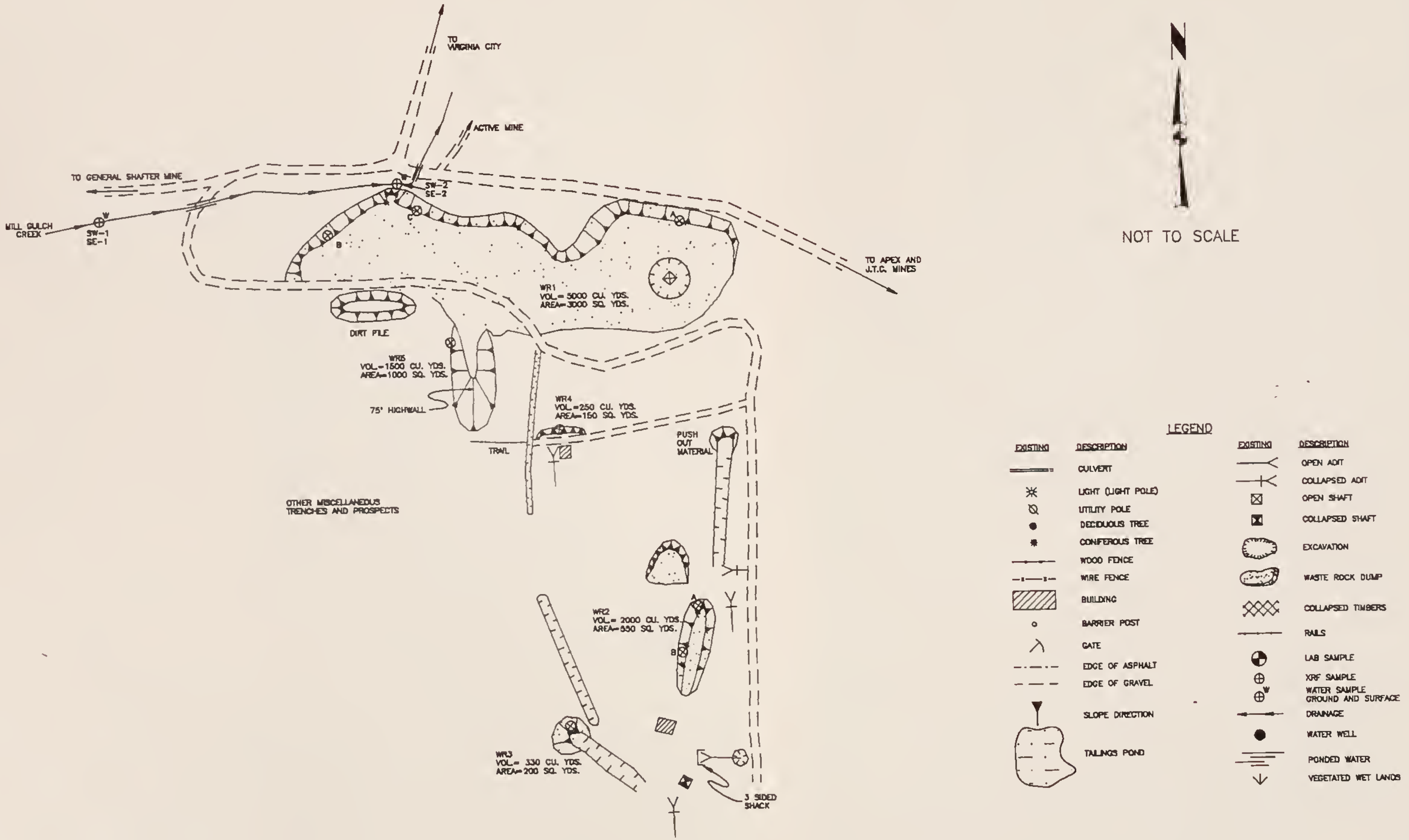


PIONEER
TECHNICAL SERVICES, INC.

KEARSAGE, P.A. NO. 29-102

T07S, R03W, SECTION 23

SCALE: 1" = 1000'



DRAWN JJP DATE 19 OCT 93
DESIGNED JPR JOB NO. 93-17
APPROVED WJB F.B. NO.

PIONEER TECHNICAL SERVICES INC. BUTTE, MT.

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS–BOZEMAN–KALISPELL MONTANA
SPOKANE WASHINGTON

TD&H

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY
KEARSAGE PA# 29-102
VIRGINIA CITY DISTRICT MADISON COUNTY

SHEET NO.

29-102.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)[*]	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	5,000	East side of dump near shaft	None	5.2 (D)	0.04	29-102-WR-1	07/20/93 1825	T-Metals, ABA
WR-1B	WR		West side of dump	None	5.6 (D)	0.05			
WR-1C	WR		Center of dump	None	6.0 (D)	0.05			
WR-2A	WR	2,000	Off northern toe of dump	None	6.0 (D)	0.05	29-102-WR-2	07/20/93 1830	T-Metals, ABA
WR-2B	WR		Off west side of dump	None	6.6 (D)	0.05			
WR-3	WR	330	Off western toe of dump	None	6.2 (D)	0.05			
WR-4	WR	250	Center of dump near top	None	6.4 (D)	0.04			
WR-5	WR	1,500	From pile west of large trench	None	6.0 (D)	0.04			

[*] D-Direct reading(Kelvey Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 29-102-WR-1 is composite of WR-1A through -1C. 29-102-WR-2 is composite of WR-2A and -2B, and WR-3 through -5. See Apex (29-105) for background soil sample.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No X , Number:____ Identification:________

Filled shafts: Yes___, No X , Number:____ Identification:________

Seeps/Springs: Yes___, No X , Number:____ Identification:________

Groundwater wells within 4 miles?: Yes X , No___;
Number of well logs: 1

Distance to nearest well used for drinking? 4 miles

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible X , Unlikely____.
Uncontained sources with metal values at or slightly above expected background levels; waste rock is in shallow groundwater location.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: ______________________________

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.												

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ______________________________

____

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X , No ___, Name(s): Mill Gulch

Dry streambeds: Yes ____, No X , Name(s): ____

Other surface water: Yes ____, No X , Name(s)/Description: ____

Waste materials within any floodplain: Yes X , No ___ Source ID(s): WR-1

Approximate Flood frequency? X 1 yr, ___10 yr, ___100 yr

Estimated seasonal flow of stream(s) (cfs)? 0.75 cfs
High Flow: 5.0 cfs , Average Flow: 1.0 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes ____, No X ,
Describe: ____

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Wetland, fishery, irrigation

Observed erosional/sedimentation/stream turbidity problems? Yes X ,
No _____, Distance downstream (ft)? Unknown Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):
Sedimentation of Mill Gulch from logging.

SURFACE WATER INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Upgradient (300') from WR-1 in Mill Gulch	7.97	NM	124	11.3	80	0.75 cfs (M)	29-102-SW-1	07/20/93 1510	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	Upgradient (300') from WR-1 in Mill Gulch	N/A	N/A	N/A	N/A	N/A	N/A	29-102-SE-1	07/20/93 1510	T-Metals, CN-
SW-2	SW	At PPE in Mill Gulch of WR-1	8.26	NM	172	11.9	86	0.75 cfs (M)	29-102-SW-2	07/20/93 1450	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-2	SE	At PPE in Mill Gulch of WR-1	N/A	N/A	N/A	N/A	N/A	N/A	29-102-SE-2	07/20/93 1450	T-Metals, CN-

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): NM = Not Measured

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? None

Wetlands present: Yes X , No ___, Describe: Streamside on-site

Carbonate rocks/soils: Yes ___, No X , Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30 X ; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence(ft or miles)? 4 miles

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
WR-1	SO3	Moist	27,000	27,000	Yes	Low/Moderate
WR-2	SO3	Moist	1,950	2,475	Yes	Low/Moderate
WR-3	SO3	Moist	1,800	1,350	Yes	Low/Moderate
WR-4	SO3	Moist	1,350	1,013	Yes	Low/Moderate
WR-5	SO3	Moist	9,000	9,000	Yes	Low/Moderate

Notes and Clarifications: ______

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes_X_, No____,
Describe: Loggers

Population within 1 mile: 1-10___; 10-30_X_; 30-100___; 100-300___;
300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments____

Evidence of recreational use on site: Yes___, No_X_, Describe:____

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment____
Wilderness Area - Yes___, No_X_, Comment____
T&E Species Habitat - Yes___, No_X_, Comment____
Bat Habitat - Yes_X_, No___, Comment Adit

Primary Drainage___; Secondary Drainage_X_; No Information___:

Riparian Habitat Quality - High_X_, Medium___, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - Not Rated
Sport Fishery Classification - Not Rated

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_2_, types and locations:
One shaft (barb wire fence) and 1 adit

Hazardous structures: Yes___, No_X_, Number____, types and locations:____

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____,
types and locations:____

Unstable waste piles, impoundments, undercut banks: Yes____, No_X_,
Number____, types and locations:____

Fire and/or Explosion hazards: Yes___, No_X_, Explain:____

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Kearsage, Prepared by Northern Engineering and Testing, August 13, 1987.

MDSL/AMRB Files, Montana Cultural Resources Inventory Historic Mine Reconnaissance Form, Project: Bureau of Land Management Reconnaissance of the Summit, Browns Gulch, and Hungry Hollow Mining Districts, Madison County, Montana, Prepared by Jerry Clark, July 12, 1990.

USGS, Mining Districts of the Dillon Quadrangle, Montana and Adjacent Areas, Bulletin 574, Written by Alexander N. Winchell, 1914.

USGS, Topographic Map, Cirque Lake, Montana, 7 1/2 minute Quadrangle, 1988.

LABORATORY ANALYTICAL DATA

KEARSAGE
PA NO. 29-102

MDSL AMRB/PIONEER 4/9/93

Kearsage PA# 29-102
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER – BABITS
INVESTIGATION DATE: 07/20/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-102-SE-1	5 U	54.4	0.9 J	9.1	31.7	17.7	12900	0.244	181	22	16	6 U	41	0.338 U
29-102-SE-2	5 U	111	2.8 J	18.5	83	41.2	26200	0.461	354	49	80	7 U	124	0.338 U
29-102-WR-1	25	122	6.8 J	45	160	78.1	61500	0.392	883	100	41	5 U	234	NR
29-102-WR-2	11	232	4.8 J	46.8	482	111	52200	0.679	452	224	29	5 U	183	NR
BACKGROUND	6 U	155	2.2 J	17	71.1	14.5	24800	0.255	821	46	13	8 U	73	NR

U – Not Detected; J – Estimated Quantity; X – Outlier for Accuracy or Precision; NR – Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
29-102-WR-1	0.59	18.4	76.6	58.1	<0.01	0.5	0.16	15.6	60.9
29-102-WR-2	<0.01	0	17.6	17.6	<0.01	<0.01	0.03	0	17.6

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-102-SW-1	1.69 U	30.5	2.57 U	9.7 U	6.83 U	1.55 U	262	0.038 U	8.53	12.7 U	1.55 U	30.7 U	7.57 U	83.6
29-102-SW-2	1.69 U	31.7	2.57 U	9.7 U	6.83 U	1.55 U	319	0.038 U	9.4	12.7 U	1.55 U	30.7 U	7.57 U	85.3

U – Not Detected; J – Estimated Quantity; X – Outlier for Accuracy or Precision; NR – Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-102-SW-1	118	< 5.0	8	< 0.05	NR
29-102-SW-2	126	< 5.0	8	< 0.05	NR

LEGEND

SE1 – 300 feet upgradient from waste rock dump 1 in Mill Gulch.
SE2 – At PPE in Mill Gulch of waste rock dump 1.
WR1 – Composite of subsamples WR1A, 1B, and 1C.
WR2 – Composite of subsamples WR2A, 2B, 3, 4, and 5.
BACKGROUND – From the Apex Mine (29-105-SS-1).
SW1 – Same as SE1.
SW2 – Same as SE2.

XRF ANALYSIS RESULTS

KEARSAGE
PA NO. 29-102

MDSL AMRB/PIONEER 4/9/93

Mine Name: Kearsage PA# 29-102
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
29-102-WR1-A		22575.9	7711.01	3071.09		408.575 *	35068.5		60.6622 *	125.417 *		44.3885
29-102-WR1-B			13885.2	5771.11		1610.83	75253.8		77.2855 *	246.821		57.7524
29-102-WR1-C			14388.6	5137.09		1164.05 *	63673.4			303.331	48.7311 *	156.642
29-102-WR2-A			8648.53	3555.94		704.089 *	39471.4		79.8288 *	221.529		53.2658
29-102-WR2-B	1211.29 *		9177.98	3806.69	681.768	1200.67 *	82810.5			185.883	60.5472 *	71.962
29-102-WR-1-COMP			16113.9	4798.77		1075.71 *	65100.3		91.874 *	171.971 *		103.01
29-102-WR-2-COMP	1025.63 *		8894.19	4011.25	513.579 *	900.292 *	64944.2		88.3067 *	255.79		60.5005
29-102-WR-3	932.25 *		8117.8	4367.93	535.951 *	600.752 *	75318.2		74.6473 *	231.756		62.8828
29-102-WR-4	771.678 *		9772.45	4201.25	528.078 *	541.685 *	73091.5		94.1513 *	194.415		60.2961
29-102-WR-5			9046.91	5641.48		1214.41 *	66713.2			170.728 *		92.1096

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
29-102-WR1-A	224.04			27.142 *	115.592			399.301	100.312 *	11.696 *	8.14386 *
29-102-WR1-B	209.588			53.2839 *	139.375			340.416			7.65527 *
29-102-WR1-C	179.4			74.0345 *	123.401	211.253 *		362.027	130.598 *		13.7784 *
29-102-WR2-A	271.5			47.7853 *	142.336			534.98	89.3233 *		10.3887 *
29-102-WR2-B	115.456				75.9362			341.419	154.516 *		
29-102-WR-1-COMP	165.5			46.753 *	123.882			266.152	139.362 *		6.43521 *
29-102-WR-2-COMP	132.906			38.5106 *	102.693			335.585			
29-102-WR-3	138.064			41.8819 *	83.6188			362.232	110.075 *		
29-102-WR-4	127.914			39.4967 *	71.7393			338.175	107.234 *		
29-102-WR-5	98.8447			31.848 *	96.8962			361.919	163.184 *		

* - Estimated Quantity
$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

KEARSAGE
PA NO. 29-102

MDSL AMRB/PIONEER 4/9/93

AIMSS SCORESHEET

SITE NAME: KEARSAGE MINE
PA NUMBER: 29-102

GROUNDWATER PATHWAY

LINE NO.				
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2.424
6	GW - TARGETS	WELLS - 1 MI. x 2.5		0.0
7		WELLS - 1 TO 4 MI		1
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	1.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	970

SURFACE WATER PATHWAY

11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	700
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2.655
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19		FISHERY		0
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	17
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	31595

AIR PATHWAY

25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		15
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	75
27		LIKELIHOOD SCORE	LINES 25 + 26C	75
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.089
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	20
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	134

DIRECT CONTACT PATHWAY

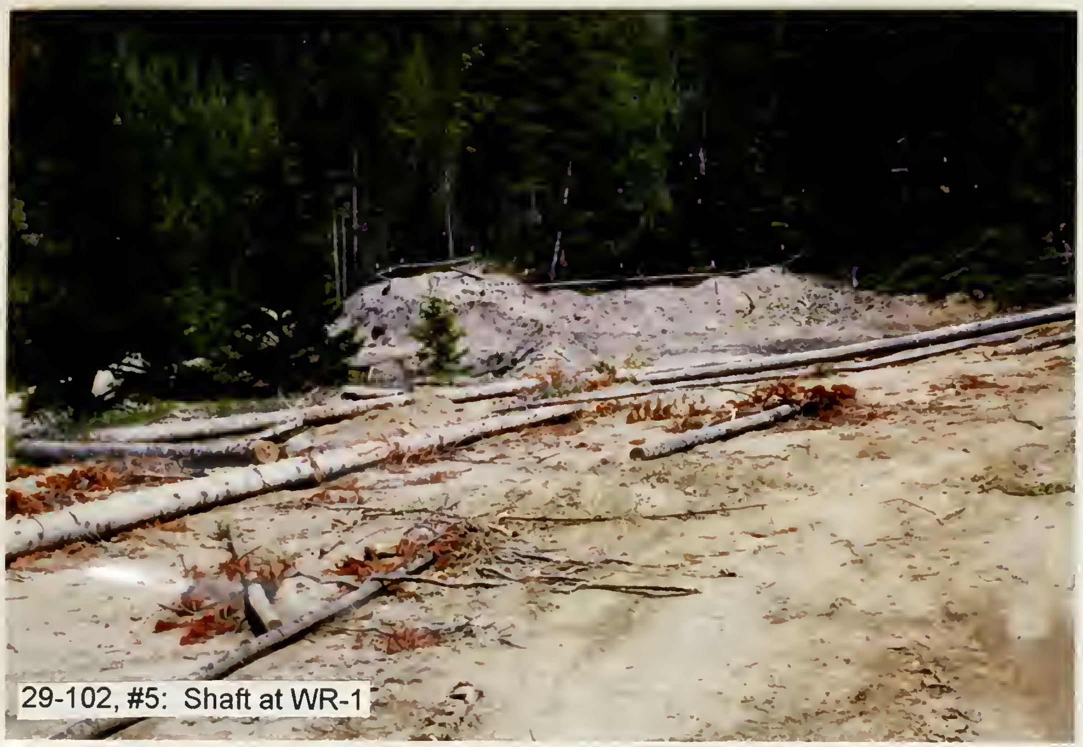
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		200
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	300
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.081
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		10
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 THRU 42	10
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	243

45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000	**0.33**

SITE NAME: KEARSAGE MINE
PA NUMBER: 29-102

SITE SAFETY

LINE NO.				
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	100
3		OPEN ADITS	50 EA.	50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	150
9		POPULATION - 1 MILE		10
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 THRU 11	10
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**30.00**



29-102, #5: Shaft at WR-1

29-102, #6: Miller Gulch, WR-1, and loadout

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: GENERAL SHAFTER PA#: 29-103

Date: July 21, 1993 Time: 1600

Field Team Leader: Babits, Pioneer

Sampling Personnel: Pierson, TD&H
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Warm (55°F); overcast; slight to hard rain; breezy (5-10 mph); cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): No photos or video taken due to rain.

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Coversoil and revegetate waste rock. Treatment of adit discharge may not be needed.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): GENERAL SHAFTER PA#: 29-013

Legal Description: T 7S ;R 3W ;Sec. 23 , SW1/4 NW1/4 ___1/4

County: MADISON Mining District: VIRGINIA CITY

Latitude: N 45° 12' 05" Longitude: W 111° 56' 03"

Primary Drainage Basin and Code: Alder Gulch/10020003
Secondary Drainage Basin: Mill Gulch

USGS Quadrangle map name(s): Cirque Lake

Mine Type/Commodities: Hardrock/Gold

Activity Status: Active___, Inactive/Exploration X , Abandoned___.

Ownership status: Known YX N__; private/public? Private
Owner, Agent, or Contact(Include address and phone when available): Hanover Gold, Group S Limited, P.O. Box B, Roslyn, NY 11576.

Relationship to other mines/sites in the area/district: Unknown

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? One adit has been filled with waste rock and reseeded.

General site features: Elevation 7800', Slope 25°, Aspect South

Land use: Mining X , Recreational___, Residential___, Urban___, Agricultural X , Other(Specify)

Area of disturbed/unvegetated lands? < 1 acres.
Dimensions:

Predominant vegetation types: Grasses, fir

Access: roads - good___, poor___, 4wd X , trail___.
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site is underlain by Precambrian schists and gneisses; some recent volcanic flows and Tertiary lake bed stream gravels. Mill Gulch flows west to east at the site and meets Alder Gulch approx. 0.75 mile downstream.

Mining/milling history, ore type/tenor, host rock, gangue: 1899 to Unknown; in 1901, a 5-stamp mill was installed. No other information available.

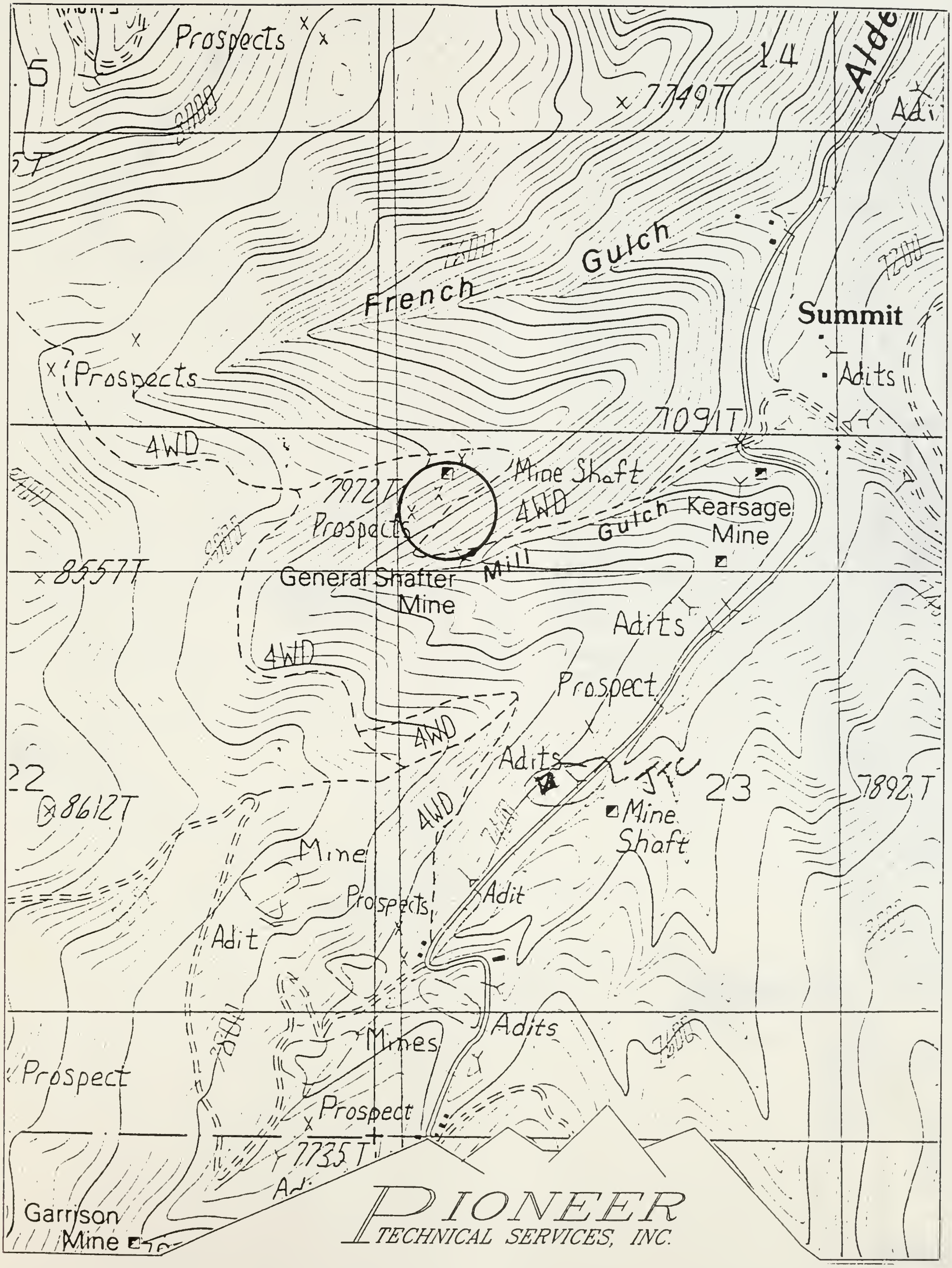
Mine Operation?
Shafts - Yes___, No X , # ____, Comment
Adits - Yes X , No___, # 3 , Comment All collapsed or filled
Pits - Yes___, No X , # ____, Comment
Placers - Yes___, No X , # ____, Comment
Other - Yes___, No X , # ____, Comment

Mill Operation? Yes X , No____. If yes answer the next three questions:

Period(s) of Operation: 1900 to Unknown

Origin of Ore Milled - Custom Mill___ Dedicated Mill___; Number and names of mines that supplied mill feed: Unknown

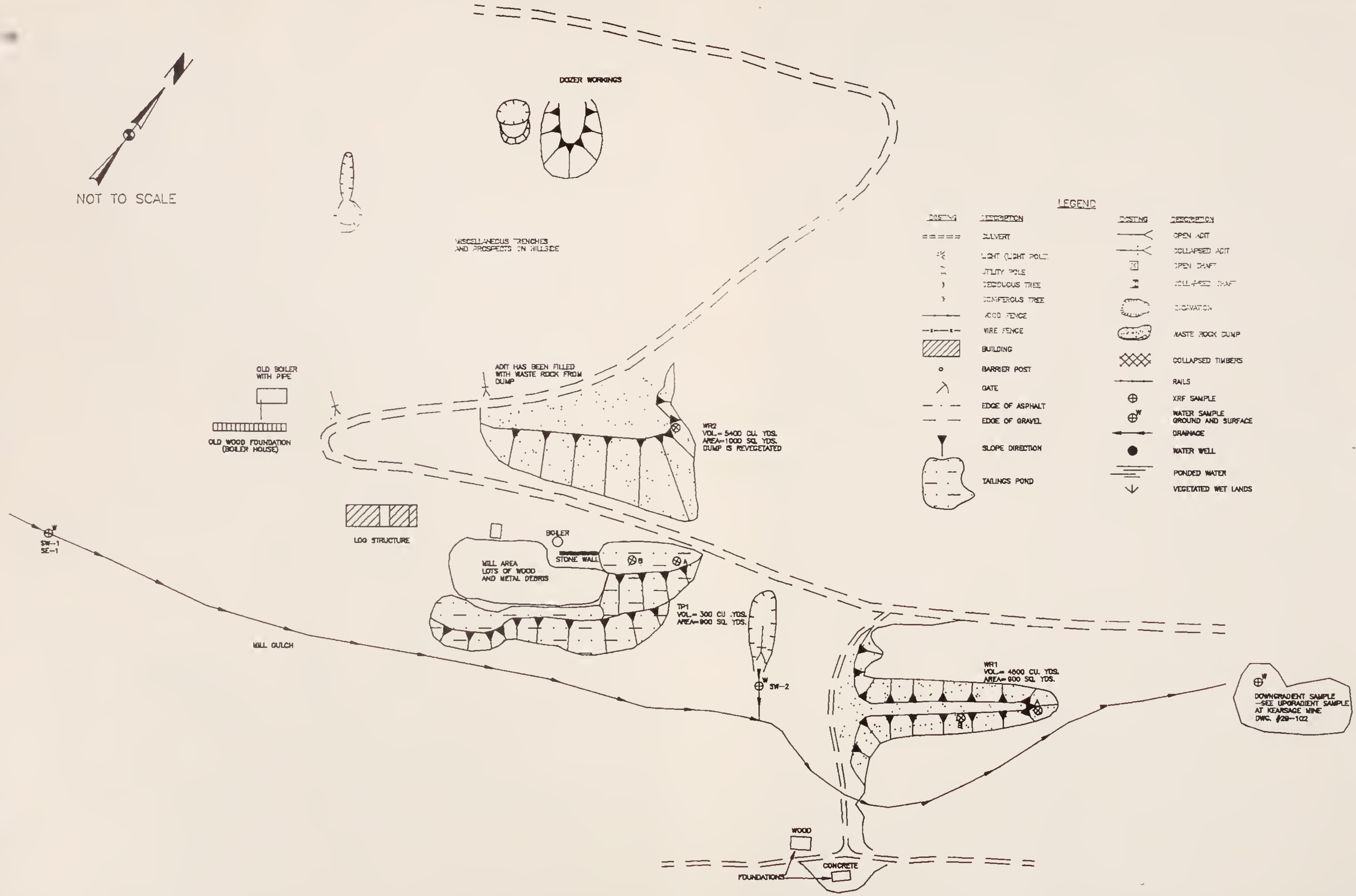
Process? Hg-amalgam, CN$^-$ leach (vat, heap), floatation, smelting?
Barr amalgamator with CN- attachment



PIONEER
TECHNICAL SERVICES, INC.

GENERAL SHAFTER, P.A. NO. 29-103

T07S, R03W, SECTION 23



DRAWN JTP DATE 21 OCT 93
DESIGNED TPR JOB NO. 93-17
APPROVED WJB F.B. NO.

PIONEER
TECHNICAL SERVICES, INC. BUTTE, MT.

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS BOZEMAN-KALISPELL MONTANA
SPOKANE WASHINGTON

TD&H

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

GENERAL SHAFTER PA# 29-103
VIRGINIA CITY DISTRICT MADISON COUNTY

SHEET NO.

29-103.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): Fine sand

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Tailings are in a pile; on or mixed with soil, only one foot deep.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Moist

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): No impoundment; tailings are in a moderately vegetated pile.

Comments on potential for mitigation: Tailings are currently vegetated.

SOURCE INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	4,500	Waste rock on Mill Gulch off knob on east end	None	5.8 (D)	0.06	29-103-WR-1	07/21/93 1000	T-Metals, ABA
WR-1B	WR		Waste rock on Mill Gulch near middle of south side.	None	6.0 (D)	0.04			
WR-2	WR	5,400	West above mill off knob east end	None	6.8 (D)	0.06			
TP-1A	TAIL	300	Northeast end on Mill Gulch	None	6.6 (D)	0.05	29-103-TP-1	07/21/93 1010	T-Metals, ABA, CN-
TP-1B	TAIL		North side just east of stone wall	None	6.8 (D)	0.04			

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 29-103-WR-1 is composite of WR-1A and -1B, and WR-2. 29-103-TP-1 is composite of TP-1A and -1B. See Apex (29-105) for background soil sample.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X , No ___, Number: 1 Identification: Collapsed adit on Mill Gulch flows into Mill Gulch.

Filled shafts: Yes___, No X , Number:____ Identification:________

Seeps/Springs: Yes___, No X , Number:____ Identification:________

Groundwater wells within 4 miles?: Yes X , No___;
Number of well logs: 1

Distance to nearest well used for drinking? 2 miles

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible X , Unlikely____.
Uncontained sources; however, metal values in dumps and tailings only slightly elevated above expected background.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-2	AD	Adit discharge on Mill Gulch	0.5 gpm (E)	8.39	NM	159	8.8	196	N/A	29-103-SW-2	07/21/93 1630	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3

*FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): NM = Not Measured

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X , No ___, Name(s): Mill Gulch

Dry streambeds: Yes ____, No X , Name(s):

Other surface water: Yes ____, No X , Name(s)/Description:

Waste materials within any floodplain: Yes X , No ___ Source ID(s): TP-1 and WR-1 are in Mill Gulch.

Approximate Flood frequency? X 1 yr, ___10 yr, ___100 yr

Estimated seasonal flow of stream(s) (cfs)? 15 gpm during sampling
High Flow: 150 gpm , Average Flow: 20 gpm

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes ____, No X ,
Describe:

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Irrigation, fishery, wetland

Observed erosional/sedimentation/stream turbidity problems? Yes X , No _____, Distance downstream (ft)? N/A Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):
Logging sedimentation

SURFACE WATER INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Upgradient of mill building in Mill Gulch	8.35	NM	187	7.9	51	15 gpm (E)	29-103-SW-1	07/21/93 1700	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	Upgradient of mill building in Mill Gulch	N/A	N/A	N/A	N/A	N/A	N/A	29-103-SE-1	07/21/93 1700	T-Metals
SW-1	SW	Upgradient sample from Kearsage site, downgradient of General Shafter	7.97	NM	124	11.3	80	0.75 cfs (M)	29-102-SW-1	07/20/93 1510	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	Upgradient sample from Kearsage site, downgradient of General Shafter	N/A	N/A	N/A	N/A	N/A	N/A	29-102-SE-1	07/20/93 1510	T-Metals

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): See Kearsage (29-102) for downgradient samples for this site. NM = Not Measured

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? None

Wetlands present: Yes X , No___, Describe: Limited to streamside

Carbonate rocks/soils: Yes X , No___, Describe: Carbonate precipitate on rocks.

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30 X ; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence(ft or miles)? 1 mile

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	**ACID MINE DRAINAGE CHARACTERISTICS** (LIST)	**MOISTURE CONTENT** (WET/DRY/PARTIAL)	**SURFACE AREA** (SQUARE FEET)	**UNCOVERED/UNVEGETATED AREA** (SQUARE FEET)	**AVAILABLE FINES** (YES/NO)	**DUST PROPAGATION POTENTIAL** (OBSERVED/HIGH/MODERATE/LOW/NONE)
WR-1	SO3	Moist	8,100	8,100	Yes	Low
WR-2	SO3	Moist	9,000	0	Yes	Low/None
TP-1	None	Moist	8,100	0	Yes	Low/None

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No_X_, Describe:______________________________

Population within 1 mile: 1-10_X_; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments______________________________

Evidence of recreational use on site: Yes___, No_X_, Describe:______________________________

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment______________
Wilderness Area - Yes___, No_X_, Comment______________
T&E Species Habitat - Yes___, No_X_, Comment______________
Bat Habitat - Yes___, No_X_, Comment______________

Primary Drainage___; Secondary Drainage_X_; No Information___:

Riparian Habitat Quality - High_X_, Medium___, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - Not Rated
Sport Fishery Classification - Not Rated

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes___, No_X_, Number____, types and locations:______________________________

Hazardous structures: Yes___, No_X_, Number____, types and locations:______________________________

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____, types and locations:______________________________

Unstable waste piles, impoundments, undercut banks: Yes____, No_X_, Number____, types and locations:______________________________

Fire and/or Explosion hazards: Yes___, No_X_, Explain:______________________________

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for General Shafter, Prepared by Northern Engineering and Testing, August 13, 1987.

MDSL/AMRB Files, Montana Cultural Resources Inventory Historic Mine Reconnaissance Form for General Shafter, Project: Bureau of Land Management Reconnaissance of the Summit, Browns Gulch, and Hungry Hollow Mining Districts, Madison County, Montana, Prepared by Jerry Clark, July 16, 1990.

USGS, Mining Districts of the Dillon Quadrangle, Montana and Adjacent Areas, Bulletin 574, Written by Alexander M. Winchell, 1914.

USGS, Topographic Map, Cirque Lake, Montana, 7 1/2 minute Quadrangle, 1988.

LABORATORY ANALYTICAL DATA

GENERAL SHAFTER
PA NO. 29-103

MDSL AMRB/PIONEER 4/9/93

General Shafter PA# 29-103
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BABITS
INVESTIGATION DATE: 07/21/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-102-SE-1	5 U	54.4	0.9 J	9.1	31.7	17.7	12900	0.244	181	22	16	6 U	41	0.338 U
29-103-SE-1	6	63.7	1.2 J	12.2	51.3	18.2	14800	0.344	243	30	14	7 U	62	NR
29-103-TP-1	16	40.7	4.3 J	10.1	9.4	178	9730	1.97	261	21	521	52	421	9.72
29-103-WR-1	11	54.5	2.3 J	11	24.4	39.1	15100	0.704	591	28	109	6 U	139	NR
BACKGROUND	6 U	155	2.2 J	17	71.1	14.5	24800	0.255	821	46	13	8 U	73	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
29-103-TP-1	0.01	0.31	22.8	22.4	<0.01	0.01	0.01	0.31	22.4
29-103-WR-1	0.03	0.94	102	101	<0.01	0.04	0.05	1.25	101

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-102-SW-1	1.69 U	30.5	2.57 U	9.7 U	6.83 U	1.55 U	262	0.038 U	8.53	12.7 U	1.55 U	30.7 U	7.57 U	83.6
29-103-SW-1	1.69 U	18.2	2.57 U	9.7 U	9.1	1.55 U	74.1	0.038 U	5.13	12.7 U	1.55 U	30.7 U	7.57 U	51.2
29-103-SW-2	1.69 U	47.9	2.57 U	9.7 U	6.83 U	1.55 U	34.6	0.038 U	5.5	12.7 U	1.55 U	30.7 U	7.57 U	222

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-102-SW-1	118	< 5.0	8	< 0.05	NR
29-103-SW-1	97	< 5.0	5	0.1	NR
29-103-SW-2	260	< 5.0	26	0.31	NR

LEGEND

29-102-SE1 - Upgradient of Kearsage; downgradient for General Shafter.
29-103-SE1 - Upgradient of mill building in Mill Gulch.
TP1 - Composite of subsamples TP1A and 1B.
WR1 - Composite of subsamples WR1A, 1B, and 2.
BACKGROUND - From the Apex Mine (29-105-SS-1).
29-102-SW1 - Same as 29-102-SE1.
29-103-SW1 - Same as 29-103-SE1.
SW2 - Adit discharge on Mill Gulch.

XRF ANALYSIS RESULTS

GENERAL SHAFTER
PA NO. 29-103

Mine Name: General Shafter PA# 29–103
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
29–103–TP1–A			8670.65	1201.35		408.787 *	10318.9		84.9214 *	446.493		39.1494
29–103–TP1–B			6100.92	587.265		367.233 *	9124.44		137.57 *	256.264		38.3639
29–103–TP–1–COMP			7555.35	878.321	154.761 *	379.852 *	12125.4		139.979 *	370.183		46.7411
29–103–WR1–A		23923 $	46804 $	2878 $		1348 $	25715 $		63 $	294 $		112 $
29–103–WR1–B		28326.2	11831.6	4860.5		640.041 *	51409.3		72.4881 *	294.879	38.9042 *	100.87
29–103–WR–1–COMP			19732.4	1197.98	160.205 *	600.911 *	16730.3	241.704 *		84.6787 *	38.1484 *	66.0826
29–103–WR–2			7510.62	267.071 *	168.166 *	280.826 *	9362.32			66.7206 *		30.261

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
29–103–TP1–A	134.122		56.6537	349.643	96.3368		138.422	136.174			
29–103–TP1–B	130.206		29.3083	307.872	72.7066		81.6079 *	139.251	82.1256 *		
29–103–TP–1–COMP	136.705		41.511	337.675	83.5044		51.902 *	145.536	71.4925 *		14.7702 *
29–103–WR1–A	125 $	17 $		182 $	117 $	120 $		296 $	75 $	5 $	8 $
29–103–WR1–B	160.936		5.93407 *	102.53	125.964			316.073			9.60832 *
29–103–WR–1–COMP	62.1927			63.2501 *	109.008			129.995			17.1857 *
29–103–WR–2	18.2857			42.5845 *	101.081			35.672 *			27.0983

* – Estimated Quantity
$ – Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

GENERAL SHAFTER
PA NO. 29-103

AIMSS SCORESHEET

SITE NAME: GENERAL SHAFTER
PA NUMBER: 29-103

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		10
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	200
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	200
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.492
6	GW - TARGETS	WELLS - 1 MI. x 2.5		0.0
7		WELLS - 1 TO 4 MI		1
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	1.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	98
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	400
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.540
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19		FISHERY		0
20		RECREATION		0
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	12
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	2592
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.001
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	20
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	1
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		0
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.001
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		1
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 THRU 42	1
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	0
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000			**0.03**

SITE NAME: GENERAL SHAFTER
PA NUMBER: 29-103

SITE SAFETY

LINE NO.				
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	0
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 THRU 11	1
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**0.00**

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: APEX PA#: 29-105

Date: July 20, 1993 Time: 0800

Field Team Leader: Babits, Pioneer

Sampling Personnel: Pierson, TD&H
Lasher, Pioneer

Visitors: Mr. Smith and Mr. Marsden, Owners
Unidentified cat operator

Weather/Seasonality Observations: Warm (60°-65°F); partly cloudy; slight breeze (5 mph); cool, wet spring and summer

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #4: WR-6 and Alder Gulch. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Site is becoming active; no remediation needed. If not active, revegetate dumps.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): APEX PA#: 29-105

Legal Description: T 7S ;R 3W ;Sec. 23 , Cntr. of N 1/2

County: MADISON Mining District: VIRGINIA CITY

Latitude: N 45° 12' 05" Longitude: W 111° 56' 00"

Primary Drainage Basin and Code: Alder Gulch/10020005
Secondary Drainage Basin: Ruby River

USGS Quadrangle map name(s): Cirque Lake

Mine Type/Commodities: Hardrock/Gold, Talc

Activity Status: Active___,Inactive/Exploration X ,Abandoned___.

Ownership status: Known YX N__; private/public? Private
Owner, Agent, or Contact(Include address and phone when available): Hanover Gold Corp., 14 Hewlett Drive, East Williston, NY 11590.
(516) 742-1202.

Relationship to other mines/sites in the area/district: There may be a connection to an active mine downgradient in Summit.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? Exploration permit

General site features: Elevation 7400', Slope 30°,
Aspect Southeast

Land use: Mining X , Recreational X , Residential___, Urban___,
Agricultural X , Other(Specify)

Area of disturbed/unvegetated lands? 0.5-1 acres.
Dimensions:

Predominant vegetation types: Pine, fir

Access: roads - good X ,poor___,4wd___,trail___.
Other logical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site is underlain by Precambrian schists and gneisses, some volcanic, and small Tertiary lake bed gravels. Alder Gulch flows south to north adjacent to the site.

Mining/milling history, ore type/tenor, host rock, gangue: No information available.

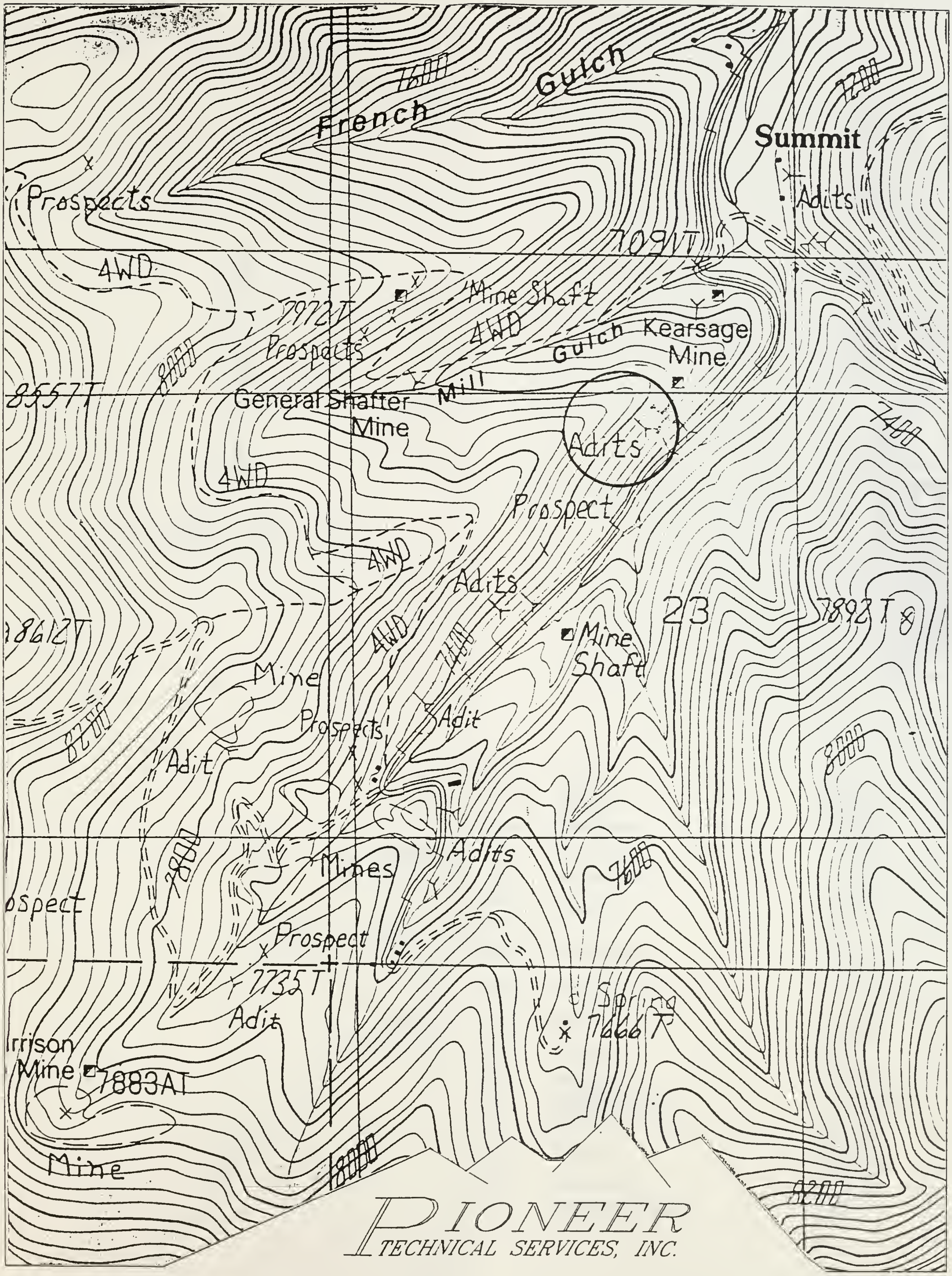
Mine Operation?
Shafts - Yes X, No ___, # 1, Comment Surrounded by barb wire
Adits - Yes X, No ___, # 4, Comment 3 open; 1 collapsed
Pits - Yes ___, No X, # ___, Comment
Placers - Yes ___, No X, # ___, Comment
Other - Yes ___, No X, # ___, Comment

Mill Operation? Yes ___, No X. If yes answer the next three questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill ___ Dedicated Mill ___; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting?
N/A

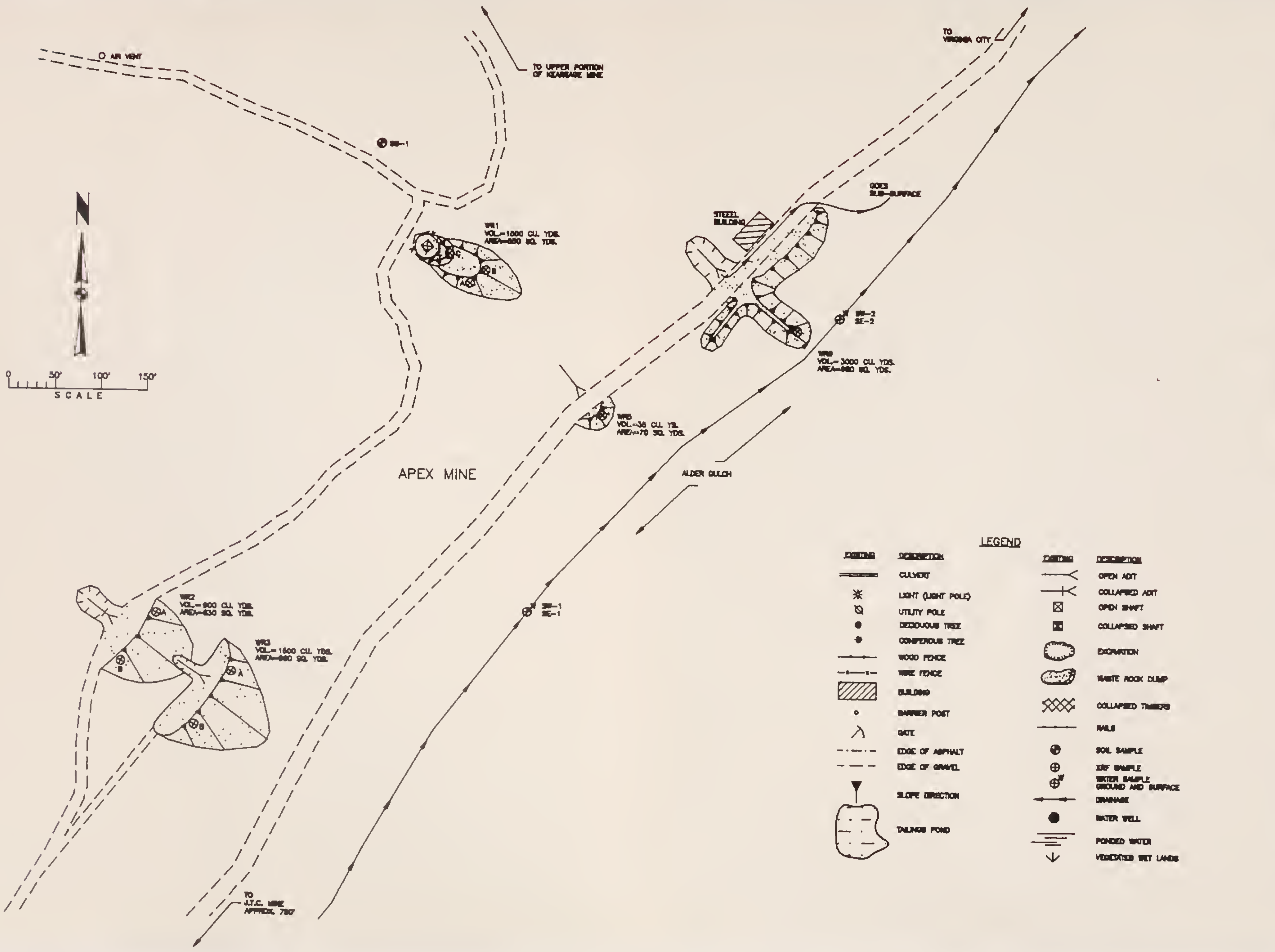


PIONEER
TECHNICAL SERVICES, INC.

APEX, P.A. NO. 29-105

T07S, R03W, SECTION 23

SCALE: 1" = 1000'



DRAWN JTP DATE 28 OCT 93
DESIGNED TER JOB NO. 93-17
APPROVED MJB F.B. NO.

PIONEER

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL MONTANA
SPOKANE WASHINGTON

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

APEX PA# 29-105
VIRGINIA CITY DISTRICT MADISON COUNTY

SHEET NO.

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	1,500	Off toe of dump	None	5.6 (D)	NM	29-105-WR-1	07/20/93 1530	T-Metals, ABA
WR-1B	WR		Off toe of dump	None	5.5 (D)	NM			
WR-1C	WR		Near shaft	None	5.5 (D)	NM			
WR-2A	WR	900	North side	None	6.2 (D)	NM	29-105-WR-2	07/20/93 1535	T-Metals, ABA
WR-2B	WR		South side	None	5.4 (D)	NM			
WR-3A	WR	1,500	East side	None	6.2 (D)	NM			
WR-3B	WR		West side	None	5.4 (D)	NM			
WR-4	WR	25	Upgradient of Apex Mine on Alder Gulch at JTC Mine	None	6.2 (D)	NM			
WR-5	WR	35	Center off toe	None	5.4 (D)	NM	29-105-WR-3	07/20/93 1540	T-Metals, ABA
WR-6	WR	3,000	Center lobe near creek	None	6.2 (D)	NM			
SS-1	BKGRND	N/A	Background soil	N/A	5.4 (D)	NM	29-105-SS-1	07/20/93 1115	T-Metals

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 29-105-WR-1 is composite of WR-1A through -1C. 29-105-WR-2 is composite of WR-2A and -2B, WR-3A and -3B, and WR-4 (See JTC PA# 29-106 for WR-4 information). 29-105-WR-3 is composite of WR-5 and WR-6. NM = Not Measured

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X , No___, Number: 1 Identification: Adit at WR-6 had very slight discharge, approx. 0.5 gpm.

Filled shafts: Yes___, No X , Number:____ Identification:____________

Seeps/Springs: Yes___, No X , Number:____ Identification:____________

Groundwater wells within 4 miles?: Yes X , No___;

Number of well logs: 1

Distance to nearest well used for drinking? 1 mile

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite____, Probable____, Possible X , Unlikely____.

Uncontained sources; however, metal values in dumps only slightly elevated.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: ______

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.												

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ______

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X , No ___, Name(s): Alder Gulch

Dry streambeds: Yes ___, No X , Name(s): ___

Other surface water: Yes ___, No X , Name(s)/Description: ___

Waste materials within any floodplain: Yes X , No ___ Source ID(s): WR-6 is in Alder Gulch.

Approximate Flood frequency? X 1 yr, ___10 yr, ___100 yr

Estimated seasonal flow of stream(s) (cfs)? 1.2 during investigation
High Flow: 5 cfs , Average Flow: 1.5 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes ___, No X ,
Describe: ___

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Irrigation, fishery, wetland

Observed erosional/sedimentation/stream turbidity problems? Yes X , No ___, Distance downstream (ft)? N/A Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):
Some sedimentation downgradient from logging activities.

SURFACE WATER INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Approx. 1,000 feet upgradient from WR-6 in Alder Gulch	8.21	NM	196	4.8	174	1.2 cfs (M)	29-105-SW-1	07/20/93 1030	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	Approx. 1,000 feet upgradient from WR-6 in Alder Gulch	N/A	N/A	N/A	4.8	N/A	N/A	29-105-SE-1	07/20/93 1100	T-Metals
SW-2	SW	Approx. 50 feet downgradient from WR-6	8.20	NM	275	7.0	177	1.2 cfs (M)	29-105-SW-2	07/20/93 1100	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-2	SE	Approx. 50 feet downgradient from WR-6	N/A	N/A	N/A	N/A	N/A	N/A	29-105-SE-2	07/20/93 1100	T-Metals

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 5 acres

Wetlands present: Yes _X_, No ___, Describe: Limited to streamside

Carbonate rocks/soils: Yes _X_, No ___, Describe: Carbonate precipitate on rocks

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30 _X_; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence(ft or miles)? Approx. 1 mile (Bachelor Gulch)

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	SO3	Moist	4,950	4,950	Yes	Low
WR-2	SO3	Moist	5,670	5,103	Yes	Low
WR-3	SO3	Moist	3,640	4,320	Yes	Low
WR-5	SO3	Moist	630	630	Yes	Low
WR-6	SO3	Moist	3,820	8,820	Yes	Low

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes X , No ____, Describe: Workers on-site

Population within 1 mile: 1-10 X ; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Evidence of recreational use on site: Yes___, No X , Describe:

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No X , Comment
Wilderness Area - Yes___, No X , Comment
T&E Species Habitat - Yes___, No X , Comment
Bat Habitat - Yes X , No___, Comment Adits

Primary Drainage___; Secondary Drainage X ; No Information___:

Riparian Habitat Quality - High___, Medium___, Low Not Rated
Wetlands Frontage - High___, Medium___, Low Not Rated
Fisheries Habitat and Species Classification - 4
Sport Fishery Classification - 4

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X , No___, Number 4 , types and locations: Three adits; one shaft with barb wire fence

Hazardous structures: Yes___, No X , Number____, types and locations:

Unstable highwalls, pits, trenches, slopes: Yes___, No X , Number____, types and locations:

Unstable waste piles, impoundments, undercut banks: Yes____, No X , Number____, types and locations:

Fire and/or Explosion hazards: Yes___, No X , Explain:

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Apex, Prepared by Northern Engineering and Testing, August 14, 1987.

USGS, Topographic Map, Cirque Lake, Montana, 7 1/2 minute Quadrangle, 1988.

LABORATORY ANALYTICAL DATA

APEX
PA NO. 29-105

Apex Mine PA# 29−105
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER − BABITS
INVESTIGATION DATE: 07/20/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29−105−SE−1	8 U	118	2.1 J	16.7	119	25.9	29400	0.486	408	60	17	10 U	95	NR
29−105−SE−2	9 U	63.3	1.6 J	19.8	51.3	32.5	26600	0.488	403	37	22	11 U	86	NR
29−105−WR−1	7	190	3.1 J	28.5	88.7	70.2	33100	0.345	387	73	12	6 U	66	NR
29−105−WR−2	33	193	7.2 J	36.2	105	83.4	49800	0.502	940	81	210	6 U	260	NR
29−105−WR−3	53	29.7	14.3 J	35.9	80.6	100	54200	0.552	941	92	212	5 U	1030	NR
BACKGROUND	6 U	155	2.2 J	17	71.1	14.5	24800	0.255	821	46	13	8 U	73	NR

U − Not Detected; J − Estimated Quantity; X − Outlier for Accuracy or Precision; NR − Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
29−105−WR−1DUF	0.22	6.87	72.9	66.1	<0.01	0.16	0.12	5	67.9
29−105−WR−1	0.23	7.19	73.5	66.3	<0.01	0.14	0.13	4.37	69.1
29−105−WR−2	0.26	8.12	60.7	52.6	<0.01	0.16	0.12	5	55.7
29−105−WR−3	1.12	35	75.5	40.5	<0.01	1.11	0.37	34.7	40.8

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29−105−SW−1	1.69 U	32.6	2.57 U	9.7 U	6.83 U	1.55 U	17.3	0.038 U	4.08 U	12.7 U	1.55 U	30.7 U	7.57 U	183
29−105−SW−2	1.69 U	34.6	2.57 U	9.7 U	6.83 U	1.55 U	42	0.038 U	4.08 U	12.7 U	1.55 U	30.7 U	7.57 U	186

U − Not Detected; J − Estimated Quantity; X − Outlier for Accuracy or Precision; NR − Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2−N	CYANIDE
29−105−SW−1	244	< 5.0	7	0.17	NR
29−105−SW−2	211	< 5.0	7	0.21	NR

LEGEND

SE1 − Approx 1,000' upgradient from waste rock dump 6 in Alder Gulch.
SE2 − Approx. 50' downgradient from waste rock dump 6.
WR1 − Composite of subsamples WR−1A through 1C.
WR2 − Composite of subsamples WR2A, 2B, 3A, 3B, and 4. (See JTC 29−106 for WR4 information).
WR3 − Composite of subsamples WR5 and 6.
BACKGROUND − From the Apex (29−105−SS−1).
WR1DUP − Duplicate of sample 29−105−WR−1.
SW1 − Same as sample SE1.
SW2 − Same as sample SE2.

XRF ANALYSIS RESULTS

APEX
PA NO. 29-105

Mine Name: Apex PA# 29–105
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
29–105–SS–1			8747.04	3856.51		1350.32	35434.3			72.8383 *		191.929
29–105–WR1–A	298.232 *	21713.3	12880.9	2263.83		545.088 *	40194.7		63.0986 *	143.687 *	39.8894 *	84.2799
29–105–WR1–B		24492.2	8108.96	2833.67		322.294 *	34913.4			102.318 *	34.9928 *	103.091
29–105–WR1–C	388.569 *		10252.9	3709.01			44365.8			198.595	57.9501 *	110.006
29–105–WR2–A			27450.2	2247.66		1417.8	50557.7		57.0129 *	502.279	56.968 *	256.988
29–105–WR2–B			12595.4	3372.19		2279.36	53525			422.93	61.4331 *	156.283
29–105–WR3–A			11794.9	4253.63		1663.85	63867			293.854	51.6231 *	95.4275
29–105–WR3–B	325.357 *		5335.59	7478.3		1488.18	74931.6			153.902 *	44.1194 *	34.0075
29–105–WR–1–COMP			10869.7	2793.88	171.03 *	494.701 *	38748.8			80.8706 *	35.2183 *	89.7559
29–105–WR–2–COMP			12650.9	3921.98		1290.96 *	56244.9		64.7607 *	269.095		141.501
29–105–WR–3–COMP			9455.83	4394.51		1273.37 *	55341			448.24	65.2063 *	118.241
29–105–WR–4			7738.26	4939.8		1148.77 *	50195.6			227.847	40.9678 *	69.4178
29–105–WR–5	334.214 *		12782.9	3702.09		853.531 *	36073.7		84.7453 *	967.303	102.286 *	369.072
29–105–WR–6			7783.38	6375.27		1918.32	79013.3			218.938		52.7742

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
29–105–SS–1	313.011			40.586 *	121.583			583.8	81.418 *		12.9367 *
29–105–WR1–A	215.811	38.0253 *		39.3461 *	89.8682			417.916	99.1278 *	14.6035 *	12.0737 *
29–105–WR1–B	204.32				94.6094			306.566	95.5497 *		16.8267 *
29–105–WR1–C	238.266			20.2731 *	119.179			493.737	95.6081 *		15.5423 *
29–105–WR2–A	108.784			157.971	102.364			1417	77.4308 *		8.27979 *
29–105–WR2–B	121.475			408.502	144.222	165.932 *		569.629	90.4171 *		13.0503 *
29–105–WR3–A	205.943			96.657	154.995	163.47 *		895.859	129.842 *		9.71949 *
29–105–WR3–B	141.032			30.8052 *	155.784			478.207			8.09346 *
29–105–WR–1–COMP	217.725			22.8543 *	97.9709			408.156			6.25623 *
29–105–WR–2–COMP	131.556			185.889	149.743			604.148	92.3521 *		6.38967 *
29–105–WR–3–COMP	126.169		12.6474 *	128.582	118.892			173.852			
29–105–WR–4	152.753		9.35928 *	46.3472 *	141.165			232.145	82.4905 *		7.81152 *
29–105–WR–5	109.292	38.1898 *	53.0261	276.135	156.027	158.381 *		196.508	102.799 *		9.21962 *
29–105–WR–6	154.505			45.5942 *	143.702	145.566 *		215.681	161.861 *		

* – Estimated Quantity
$ – Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

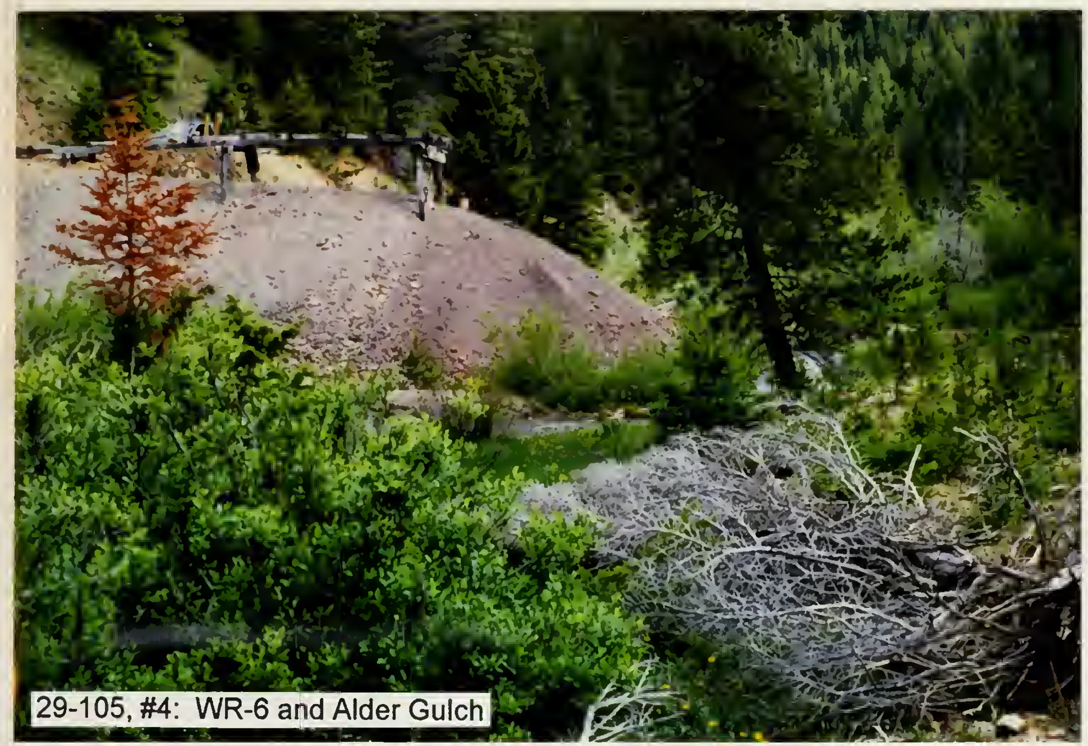
APEX
PA NO. 29-105

AIMSS SCORESHEET

SITE NAME: APEX
PA NUMBER: 29-105

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		10
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	200
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	200
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.290
6	GW - TARGETS	WELLS - 1 MI. x 2.5		0.0
7		WELLS - 1 TO 4 MI		1
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	1.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	258
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	400
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.504
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	18
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	10829
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.008
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31		WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	10
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	4
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		200
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	300
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.007
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		1
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 THRU 42	1
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	2
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000			**0.11**

LINE NO.		SITE SAFETY	SITE NAME: / PA NUMBER:	APEX / 29-105
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	100
3		OPEN ADITS	50 EA.	150
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	250
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 THRU 11	1
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**5.00**



29-105, #4: WR-6 and Alder Gulch

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: JTC PA#: 29-106

Date: August 27, 1993 Time: 0800

Field Team Leader: Babits, Pioneer

Sampling Personnel: Flammang, Pioneer
Pierson, TD&H

Visitors: None

Weather/Seasonality Observations: Sunny; warm (60°F); calm; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): Photos taken were misplaced. Video Tape No. 3

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Close adit with waste rock. Waste rock is very steep and large and would be difficult to revegetate.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): JTC PA#: 29-106

Legal Description: T 7S ;R 3W ;Sec. 23 , NW1/4 SW1/4 ___1/4

County: MADISON Mining District: VIRGINIA CITY

Latitude: N 45° 12' 04" Longitude: W 111° 56' 04"

Primary Drainage Basin and Code: Ruby River/10020003
Secondary Drainage Basin: Alder Gulch

USGS Quadrangle map name(s): Cirque Lake

Mine Type/Commodities: Hardrock/Gold

Activity Status: Active___,Inactive/Exploration___,Abandoned X .

Ownership status: Known YX N__; private/public? Private
Owner, Agent, or Contact(Include address and phone when available): J. David Penwell, Attorney at Law, 125 West Mendenhall, Bozeman, MT 59771-1677. (406) 587-0693.

Relationship to other mines/sites in the area/district: Site is adjacent to the Apex mine site.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation 7400', Slope 37°, Aspect Southeast

Land use: Mining X , Recreational X , Residential___, Urban___, Agricultural___, Other(Specify)

Area of disturbed/unvegetated lands? 0.02 acres.
Dimensions:

Predominant vegetation types: Sage, grass, strawberries, Douglas fir

Access: roads - good X ,poor___,4wd___,trail___.
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site lies above and on the west side of the perennial Alder Gulch. Alder Gulch flows northeast past the site. Site is underlain by Precambrian gneisses.

Mining/milling history, ore type/tenor, host rock, gangue: No information available. Thought to be vein deposit in the gneiss with quartz, chlorite, calcite as gangue and auriferous pyrite as ore.

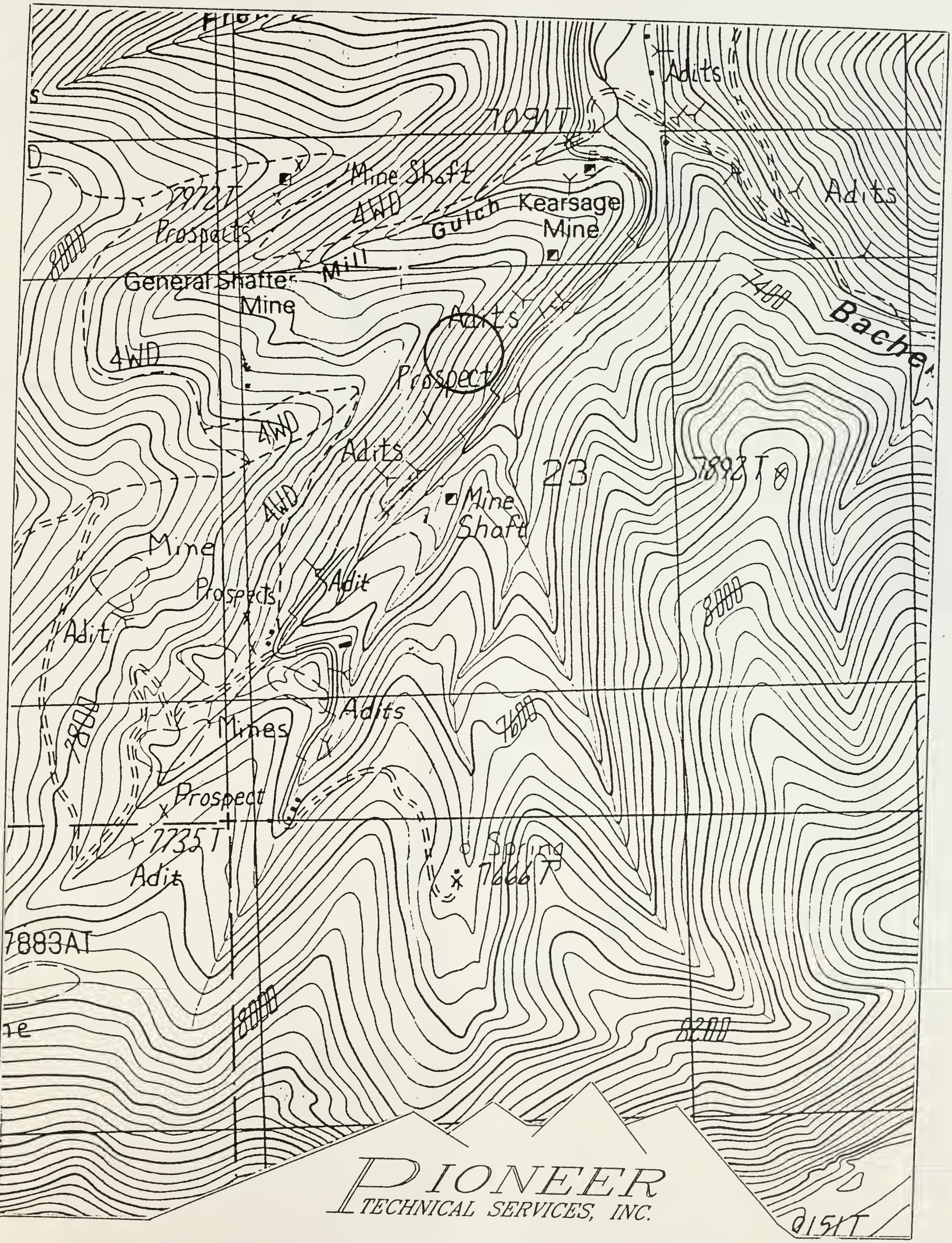
Mine Operation?
Shafts - Yes X, No ___, # 1, Comment Caved
Adits - Yes X, No ___, # 1, Comment Open
Pits - Yes ___, No X, # ___, Comment
Placers - Yes ___, No X, # ___, Comment
Other - Yes ___, No X, # ___, Comment

Mill Operation? Yes ___, No X. If yes answer the next three questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill ___ Dedicated Mill ___; Number and names of mines that supplied mill feed: N/A

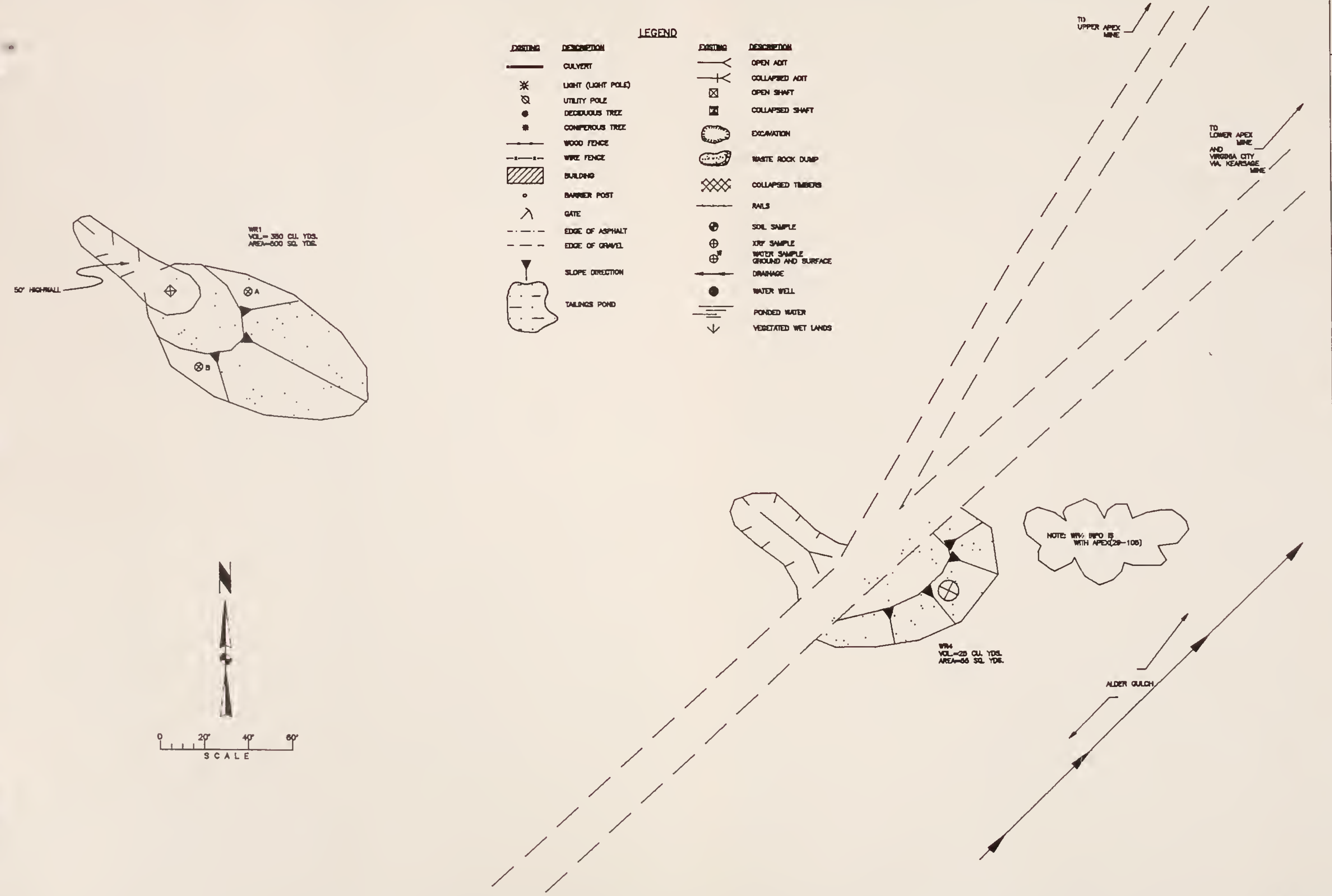
Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting?
N/A



PIONEER
TECHNICAL SERVICES, INC.

JTC, P.A. NO. 29-106

T07S, R03W, SECTION 23
SCALE: 1" = 1000'



DRAWN JTP DATE 26 OCT 93
DESIGNED TPR JOB NO. 93-17
APPROVED WJB F.B. NO.

PIONEER TECHNICAL SERVICES INC. BUTTE, MT.

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL MONTANA
SPOKANE WASHINGTON

TD&H

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

J.T.C. PA# 29-106
VIRGINIA CITY DISTRICT MADISON COUNTY

SHEET NO.

29-106.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Babits, Pierson

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	350	North side of WR-1	None	6.2 (D)	0.04	29-106-WR-1	08/27/93 1530	T-Metals, ABA
WR-1B	WR		South side of WR-1 in dark material	None	6.0 (D)	0.04			
WR-4	WR	25	Downgradient of site	None	5.8 (D)	NM	29-105-WR-2	07/20/93 1535	T-Metals, ABA

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: WR-4 was included in a composite with the Apex (29-105) lab samples. NM = Not Measured

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No X , Number:____ Identification:____________

Filled shafts: Yes___, No X , Number:____ Identification:____________

Seeps/Springs: Yes___, No X , Number:____ Identification:____________

Groundwater wells within 4 miles?: Yes X , No___;
Number of well logs: 1

Distance to nearest well used for drinking? 1 mile

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible____, Unlikely X .
Water in adit; however, pH was good. Metal values in dumps were low. Deposit type was vein, majority of sulfides probably removed.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: Babits

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	AD	Water in Adit #1	N/A	8.14	810	NM	5.4	NM	N/A	N/A	N/A	Field Parameters

*FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): NM = Not Measured. Upgradient sample was taken for the Apex mine (29-105); downgradient sample taken below Apex mine.

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes____, No X, Name(s):

Dry streambeds: Yes____, No X, Name(s):

Other surface water: Yes X, No___, Name(s)/Description: Standing water on Adit #1

Waste materials within any floodplain: Yes____, No X Source ID(s):

Approximate Flood frequency?___1 yr,___10 yr,___100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A
High Flow:________, Average Flow:________

Distance between waste source(s) and nearest surface water body (ft)? Approx. 150 feet between WR-4 and Alder Gulch.

Surface water draining onto or through waste sources: Yes____, No X,
Describe:

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?) Irrigation, agriculture, mining, wetland, proposed Virginia City National Park

Observed erosional/sedimentation/stream turbidity problems? Yes_____, No X, Distance downstream (ft)?________ Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): N/A

SURFACE WATER INVENTORY FORM

SAMPLERS: ____________________

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.											

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________________

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? (SO_3)

Presence of evaporative salt deposits? (ESD)

Discolored or turbid seepage? (SPG)

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? (FEOX)

Presence of burned or stressed vegetation? (VEG)

pH ≤ 5.0 (pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? Approx. 1 acre across from WR-4

Wetlands present: Yes X , No ___, Describe: Streamside in Alder Gulch

Carbonate rocks/soils: Yes X , No ____, Describe: None observed; however, limestone beds are present in area and pH of water in adit indicates a presence.

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30 X ; 30-100___; 100-300____; 300-1,000____; 1,000-3,000____; 3,000-10,000____; 10,000 or greater___; Comments

Nearest residence(ft or miles)? 1 mile

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits, Pierson

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	None	Dry	4,500	2,700	Yes	Low
WR-4	None	Dry	495	124	Yes	None

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No_X__, Describe:________________________________

Population within 1 mile: 1-10_X_; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments________________________________

Evidence of recreational use on site: Yes___, No_X_, Describe:_______

Accessibility - Fences, warning signs, closed roads?_Unrestricted___

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment_______________
Wilderness Area - Yes___, No_X_, Comment_______________
T&E Species Habitat - Yes___, No_X_, Comment_______________
Bat Habitat - Yes_X_, No___, Comment_Open adit_______

Primary Drainage___; Secondary Drainage_X_; No Information___:

Riparian Habitat Quality - High___, Medium___, Low_Not Rated
Wetlands Frontage - High___, Medium___, Low_Not Rated
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _4_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_1__, types and locations:___ Adit #1________________________________

Hazardous structures: Yes___, No_X_, Number____, types and locations:_

Unstable highwalls, pits, trenches, slopes: Yes_X_, No___, Number_1__, types and locations:_ 50 to 75 feet highwall on shaft; approx. 50 feet highwall plus drop into collapsed shaft.________

Unstable waste piles, impoundments, undercut banks: Yes____, No_X_, Number____, types and locations:________________

Fire and/or Explosion hazards: Yes___, No_X_, Explain:_______________

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for JTC, Prepared by Northern Engineering and Testing, August 14, 1987.

USGS, Mining Districts of the Dillon Quadrangle, Montana, and Adjacent Areas, Bulletin 574, Written by Alexander N. Winchell, 1914, p. 158-165.

USGS, Topographic Map, Cirque Lake, Montana, 7 1/2 minute Quadrangle, 1988.

LABORATORY ANALYTICAL DATA

JTC
PA NO. 29-106

MDSL AMRB/PIONEER 4/9/93

J.T.C. PA# 29–106
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER – BABITS
INVESTIGATION DATE: 08/27/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29–106–WR–1	7.5 J	89.4	1.28 J	30.3	112	51.9	37200	0.343 J	362	62.7	30.1	5.4 U	163	NR
BACKGROUND	6 U	155	2.2 J	17	71.1	14.5	24800	0.255	821	46	13	8 U	73	NR

U – Not Detected; J – Estimated Quantity; X – Outlier for Accuracy or Precision; NR – Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
29–106–WR–1DUF	0.3	9.37	40.8	31.5	0.04	0.13	0.13	4.06	36.8
29–106–WR–1	0.3	9.37	41.7	32.3	0.03	0.13	0.14	4.06	37.6

LEGEND

WR1 – Composite of subsamples WR 1A and 1B.
BACKGROUND – From the Apex Mine (29–105–SS–1).

XRF ANALYSIS RESULTS

JTC
PA NO. 29-106

Mine Name: J.T.C. PA# 29-106
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
29-106-WR1-A			15560.3	4242.32		756.597 *	83081.2			221.161		95.4726
29-106-WR1-B	392.048 *		11866.1	5407.39	222.039 *	1248.33 *	70823.2			264.796		52.7203
29-106-WR-1-COMP	424.219 *		17803.2	4944.17		789.428 *	81762.9			281.853		105.952
29-105-WR-4			7738.26	4939.8		1148.77 *	50195.6			227.847	40.9678 *	69.4178

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
29-106-WR1-A	91.2422			85.9141 *	66.9651			288.677	139.022 *		
29-106-WR1-B	143.78			36.8606 *	138.539			243.942	97.9338 *		
29-106-WR-1-COMP	130.177			38.0125 *	104.586			275.105			
29-105-WR-4	152.753		9.35928 *	46.3472 *	141.165			232.145	82.4905 *		7.81152 *

* - Estimated Quantity
$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

JTC
PA NO. 29-106

AIMSS SCORESHEET

SITE NAME: JTC
PA NUMBER: 29-106

GROUNDWATER PATHWAY

LINE NO.				
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		10
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	200
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	200
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.023
6	GW - TARGETS	WELLS - 1 MI. x 2.5		0.0
7		WELLS - 1 TO 4 MI		1
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	1.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	5

SURFACE WATER PATHWAY

11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	40
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	40
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.027
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		0
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	13
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	14

AIR PATHWAY

25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.001
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31		WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	10
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	1

DIRECT CONTACT PATHWAY

36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		0
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.001
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		1
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 THRU 42	1
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	0

45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000	**0.00**

			SITE NAME:	JTC
LINE NO.		**SITE SAFETY**	PA NUMBER:	29-106
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	75
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	125
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 THRU 11	1
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**2.50**

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: PACIFIC PA#: 29-118

Date: August 26, 1993 Time: 0800

Field Team Leader: Babits, Pioneer

Sampling Personnel: Flammang, Pioneer
Pierson, TD&H

Visitors: Unidentified Exploration Geologist

Weather/Seasonality Observations: Snow to rain; cold (32° to 34°F); breezy; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #1: Adit discharge, SW-3; #2: Pit and WR-2; #3: WR-3; #4: WR-1 with Browns Gulch. Video Tape No. 3

General Comments/Observations (not covered specifically in attached Inventory Forms): Site was accessed by truck. Evidence of drill holes were found in several places. Soil and magnetic lines have been run recently across top of site.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Adit discharge has near neutral pH and may not need to be treated. Waste rock is very large and often steep with near neutral pH. At the very least, the tributary should be re-routed and pits should be filled in.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): PACIFIC PA#: 29-118

Legal Description: T 7S ;R 3W ;Sec. 15 , NW1/4___1/4___1/4

County: MADISON Mining District: VIRGINIA CITY

Latitude: N 45° 13' 45" Longitude: W 111° 57' 03"

Primary Drainage Basin and Code: Alder Gulch/10020003
Secondary Drainage Basin: Browns Gulch

USGS Quadrangle map name(s): Cirque Lake

Mine Type/Commodities: Hardrock/Gold, Silver

Activity Status: Active___,Inactive/Exploration_X_,Abandoned___.

Ownership status: Known YX_ N__; private/public? Private
Owner, Agent, or Contact(Include address and phone when available): Easton Pacific and Riverside Mining Co., P.O. Box 1011, St. Cloud, MN 56301.

Relationship to other mines/sites in the area/district: Numerous mines, abandoned and active, in the same drainage.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? Possible exploration permit

General site features: Elevation 7400'-7480' , Slope 10-30% , Aspect East and west

Land use: Mining_X_, Recreational___, Residential___, Urban___, Agricultural_X_, Other(Specify)

Area of disturbed/unvegetated lands? 9.5 acres.
Dimensions:

Predominant vegetation types: Douglas fir, grasses, lupine, columbine; strawberries are on the surrounding slopes

Access: roads - good___,poor___,4wd_X_,trail___.
Other logistical considerations (proximity to other sites). Access site up Browns Gulch; road ends at the site.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site lies on either side (east and west) of an unnamed tributary to Browns Gulch. Browns Gulch begins just below the site.

Mining/milling history, ore type/tenor, host rock, gangue: No information available.

Mine Operation?

Shafts - Yes ___, No X, # ___, Comment

Adits - Yes X, No ___, # 6, Comment 3 open or partially open; 1 collapsed

Pits - Yes ___, No X, # ___, Comment

Placers - Yes ___, No X, # ___, Comment

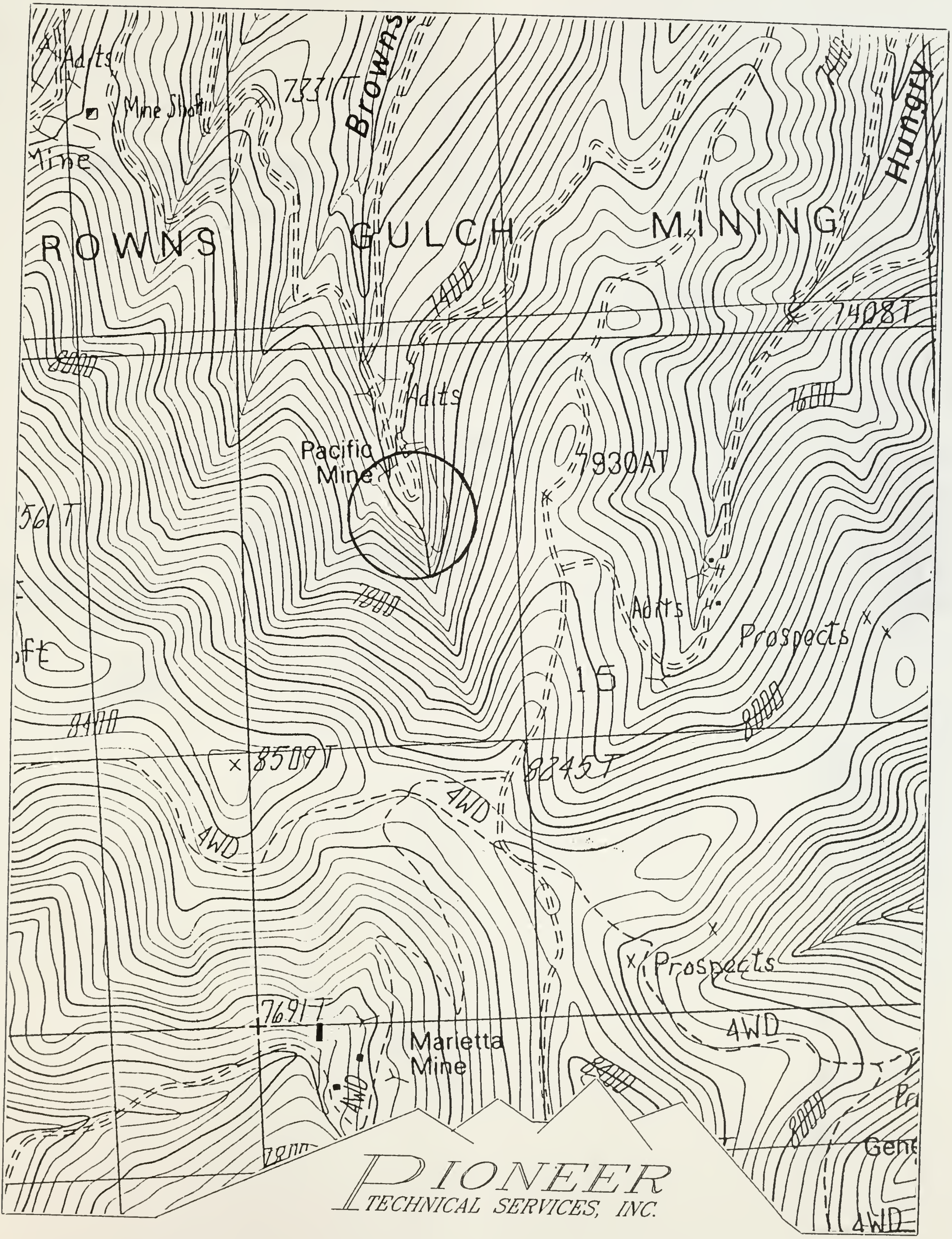
Other - Yes ___, No X, # ___, Comment

Mill Operation? Yes ___, No X. If yes answer the next three questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill ___ Dedicated Mill ___; Number and names of mines that supplied mill feed: N/A

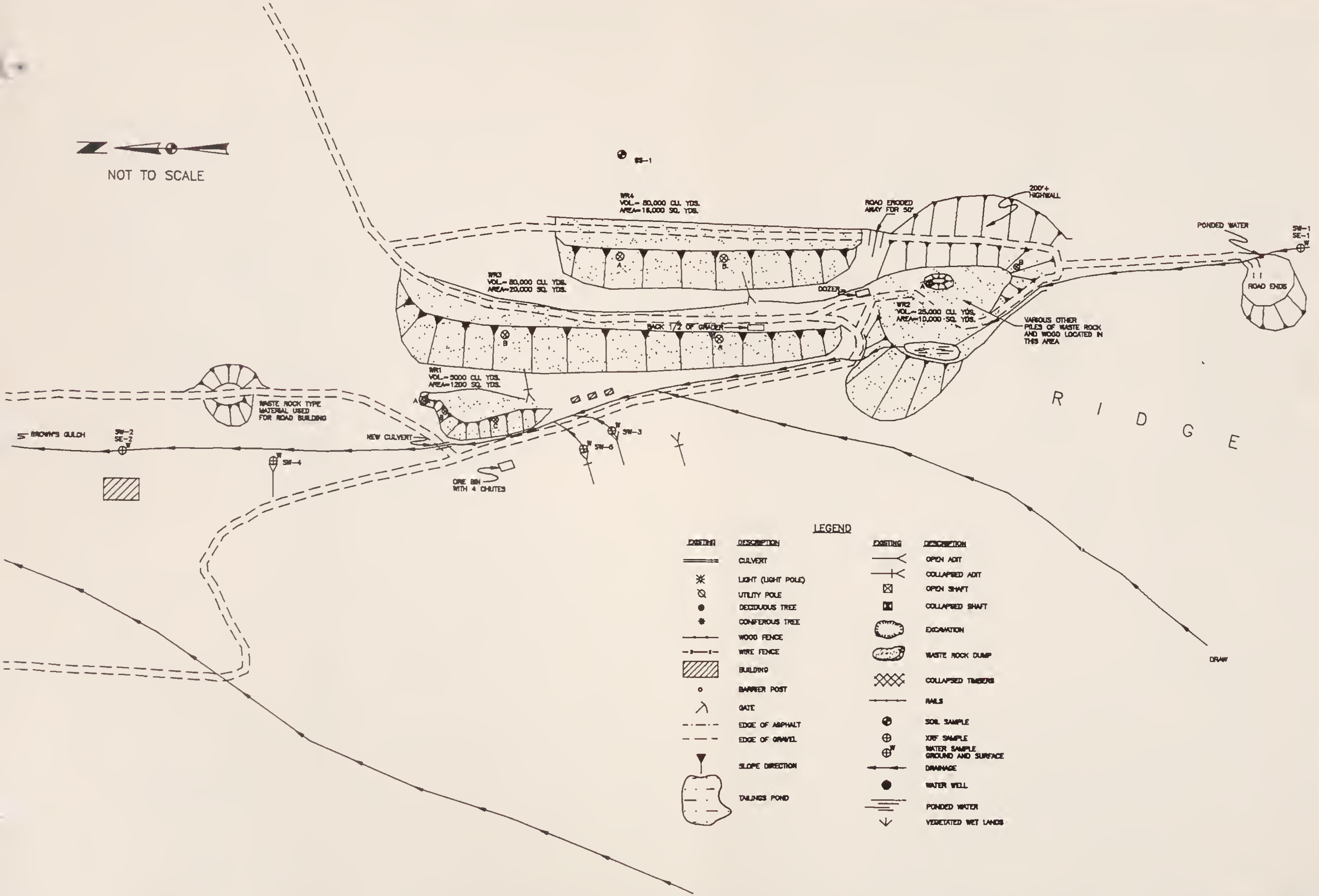
Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting? N/A



PIONEER
TECHNICAL SERVICES, INC.

PACIFIC, P.A. NO. 29-118

T07S, R03W, SECTION 15
SCALE: 1" = 1000'



MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

PACIFIC PA# 29-118
VIRGINIA CITY DISTRICT MADISON COUNTY

DRAWN JTP DATE 1 NOV 93
DESIGNED TPR JOB NO. 93-17
APPROVED WJB F.B. NO.

PIONEER

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL MONTANA
SPOKANE WASHINGTON

TD&H

SHEET NO.

29-118.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Flammang, Pierson

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	5,000	North end of WR-1 on older dump	None	6.0 (D)	0.08	29-118-WR-1	08/26/93 1735	T-Metals, ABA
WR-1B	WR		On northwest side of WR-1 on older dump	None	6.4 (D)	0.05			
WR-1C	WR		On west side of WR-1 in newer material approx. 25 feet above the creek	None	6.75 (D)	0.045			
WR-2A	WR	25,000	Composite of material from pit below highwall	None	6.8 (D)	0.06	29-118-WR-2	08/26/93 1735	T-Metals, ABA
WR-2B	WR		South end of pile	None	6.4 (D)	0.07			
WR-3A	WR	80,000	South end of pile	None	6.2 (D)	0.06			
WR-3B	WR		North end of pile	None	6.5 (D)	0.06			
WR-4A	WR	80,000	Approx. 150 feet south of the north end of WR-4; 2 feet down	None	6.8 (D)	0.065			
WR-4B	WR		Approx. 440 feet south of the north end of WR-4; 5 feet down	None	6.4 (D)	0.55			
SS-1	BKGRND	N/A	Background soil approx. 275 feet above WR-4	N/A	N/A	N/A	29-118-SS-1	08/26/93 1150	T-Metals

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 29-118-WR-1 is composite of WR-1A through -1C. 29-118-WR-2 is composite of WR-2A and -2B, WR-3A and -3B, and WR-4A and -4B.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X , No ___, Number: 3 Identification: Furthest north adit (standing water only); collapsed adit on road; and, adit across from WR-1.

Filled shafts: Yes ___, No X , Number: ___ Identification: ___

Seeps/Springs: Yes ___, No X , Number: ___ Identification: ___

Groundwater wells within 4 miles?: Yes X , No ___;
Number of well logs: 6

Distance to nearest well used for drinking? 4 miles

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite ___, Probable ___, Possible X , Unlikely ___.
Water in contact with adit walls; waste material in floodplain.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: Babits

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-3	AD	Adit discharge across the road from WR-1	0.6 cfs (M)	7.39	334	217	4.1	226	N/A	29-118-SW-3	08/26/93 0940	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SW-4	AD	Standing water in furthest north adit	0	7.31	342	221	4.3	175	N/A	N/A	N/A	Field Parameters
SW-5	AD	Adit discharge of collapsed adit	< 1 gpm (E)	7.49	322	NM	NM	NM	N/A	N/A	N/A	Field Parameters

*FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): NM = Not Measured

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X , No____, Name(s): Browns Gulch and unnamed tributary to Browns Gulch

Dry streambeds: Yes X , No___, Name(s): Headwater creek to Browns Gulch is dry at the south end of the site.

Other surface water: Yes____, No X , Name(s)/Description:

Waste materials within any floodplain: Yes X , No___ Source ID(s): WR-1

Approximate Flood frequency? X 1 yr, ___10 yr, ___100 yr

Estimated seasonal flow of stream(s) (cfs)? 1.3 cfs
High Flow: 11 cfs , Average Flow: 1.5 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet; Unnamed tributary to Browns Gulch flows right along the base of WR-1.

Surface water draining onto or through waste sources: Yes X , No____,
Describe: Unnamed tributary to Browns Gulch flows through WR-2.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Irrigation, agriculture, wetlands

Observed erosional/sedimentation/stream turbidity problems? Yes X , No_____, Distance downstream (ft)? 5 mi. Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):
Waste rock is present as sediment in stream.

SURFACE WATER INVENTORY FORM

SAMPLERS: M. Babits

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	400 feet upgradient of WR-2	8.03	231	273	3.1	103	10 gpm (E)	29-118-SW-1	08/26/93 1030	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	400 feet upgradient of WR-2	N/A	N/A	N/A	N/A	N/A	N/A	29-118-SE-1	08/26/93 1030	T-Metals
SW-2	SW	50 feet downgradient of culvert where creek crosses road at base of WR-1	8.10	320	265	4.2	150	1.3 cfs (M)	29-118-SW-2	08/26/93 0830	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-2	SE	50 feet downgradient of culvert where creek crosses road at base of WR-1	N/A	N/A	N/A	N/A	N/A	N/A	29-118-SE-2	08/26/93 0830	T-Metals
SE-3	SE	2,000 feet downgradient of WR-1; in Browns Gulch prior to confluence with unnamed tributary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ______

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? (SO_3)

Presence of evaporative salt deposits? (ESD)

Discolored or turbid seepage? (SPG)

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? (FEOX)

Presence of burned or stressed vegetation? (VEG)

pH ≤ 5.0 (pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 7 acres

Wetlands present: Yes___, No X, Describe:

Carbonate rocks/soils: Yes X, No___, Describe: None were observed on-site, but mapped in the area.

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30 X; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence(ft or miles)? 4 miles

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits, Flammang, Pierson

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	None	Partial	10,800	10,800	Yes	Low
WR-2	None	Dry	90,000	90,000	Yes	Low
WR-3	None	Dry	180,000	180,000	Yes	Low
WR-4	None	Dry	135,000	135,000	Yes	Low
SW-3	FEOX	N/A	N/A	N/A	N/A	N/A
SW-4	FEOX	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No_X_, Describe:______________________________

Population within 1 mile: 1-10_X_; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments______________________________

Evidence of recreational use on site: Yes___, No_X_, Describe:______

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment____________
Wilderness Area - Yes___, No_X_, Comment____________
T&E Species Habitat - Yes___, No_X_, Comment____________
Bat Habitat - Yes___, No_X_, Comment____________

Primary Drainage___; Secondary Drainage_X_; No Information___:

Riparian Habitat Quality - High___, Medium___, Low Not Rated
Wetlands Frontage - High___, Medium___, Low Not Rated
Fisheries Habitat and Species Classification - Not Rated
Sport Fishery Classification - Not Rated

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_3_, types and locations: WR-4, SW-3, and SW-4

Hazardous structures: Yes___, No_X_, Number____, types and locations:_

Unstable highwalls, pits, trenches, slopes: Yes_X_, No___, Number_1_, types and locations: Highwall located behind WR-2 is approx. 200 feet tall with portions of the highwall with the old road sliding or eroding.

Unstable waste piles, impoundments, undercut banks: Yes_X_, No____, Number_3_, types and locations: WR-1, WR-3, and WR-4 are all steep, mostly unvegetated, and at angle of repose.

Fire and/or Explosion hazards: Yes___, No_X_, Explain:______________

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB, Environmental Assessment Data for Pacific Mine, Prepared by MSE, Inc., November 15, 1990.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for the Pacific, Prepared by Northern Engineering and Testing, August 19, 1987.

USBM, Gold Lode Mining in the Tobacco Root Mountains, Madison County, Montana, Information Circular 6972, Written by S.H. Lorain, November 1937.

USGS, Mining Districts of the Dillon Quadrangle, Montana, and Adjacent Areas, Bulletin No. 574, Written by Alexander N. Winchell, 1914, pp. 158-165.

USGS, Topographic Map, Cirque Lake, Montana, 7 1/2 minute Quadrangle, 1988.

LABORATORY ANALYTICAL DATA

PACIFIC
PA NO. 29-118

Pacific PA# 29-118
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BABITS
INVESTIGATION DATE: 08/26/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-118-SE-1	6.99	110 J	1.37 J	11.5	33.8 JX	26.3	24600	0.055 J	444 J	30.9 JX	38.2 JX	6.91 UJ	110 J	NR
29-118-SE-2	7.35	356 J	2.57 J	14.1	18.7 JX	62.6	27200	0.437 J	424 J	24.9 JX	189 JX	6.9 UJ	310 J	NR
29-118-WR-1	7.42	91.2 J	0.88 J	24.2	286 JX	112	34400	0.253 J	494 J	149 JX	20.8 JX	5.86 UJ	74.9 J	NR
29-118-WR-2	4.49 U	100 J	0.86 UJ	11.1	21.2 JX	31.8	25700	0.071 J	490 J	24.2 JX	30.8 JX	5.93 UJ	91.7 J	NR
BACKGROUND	12.8	123 J	1.02 UJ	8.77	22.4 JX	26.4	22400	0.030 UJ	539 J	16.4 JX	7.26 UJX	7.01 UJ	52.4 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
29-118-WR-1	0.08	2.5	76.4	73.9	<0.01	0.04	0.04	1.25	75.2
29-118-WR-2	0.3	9.37	140	131	0.07	0.04	0.19	1.25	139

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-118-SW-1	1.12 U	32.2	4.59 U	5 U	6.24 U	3.67 J	59.6 J	0.2	7.47	10.9 U	0.94 U	31.7 U	33.5	105
29-118-SW-2	1.08	66.9	2.57 U	9.7 U	6.83 U	1.55 U	251	0.16 JX	55.8	12.7 U	3.66 J	30.7 U	27.8 J	171
29-118-SW-3	1.83	99.3	2.57 U	9.7 U	6.83 U	1.97	900	0.14 JX	174	13.8	1.98 J	30.7 U	36.1 J	233

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-118-SW-1	114	< 5.0	8	NR	NR
29-118-SW-2	1080	< 5.0	2424	0.05	NR
29-118-SW-3	268	< 5.0	38	< 0.05	NR

LEGEND

SE1 - 400 feet upgradient of waste rock dump 2.
SE2 - 50 feet downgradient of culvert where creek crosses road at base of waste rock dump 1.
WR1 - Composite of subsamples WR1A, 1B, and 1C.
WR2 - Composite of subsamples WR2A, 2B, 3A, 3B, 4A, and 4B.
BACKGROUND - 275' above waste rock dump 4. From Pacific (29-118-SS-1).
SW1 - Same as sample SE1.
SW2 - Same as sample SE2.
SW3 - Adit discharge across road from waste rock dump 1.

XRF ANALYSIS RESULTS

PACIFIC
PA NO. 29-118

MDSL AMRB/PIONEER 4/9/93

Mine Name: Pacific PA# 29-118
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
29-118-SE-3	345.471 *		13692.9	3040.97	188.366 *	731.203 *	35247.3			131.304 *		152.105
29-118-WR1-A			7145.86	1455.82	228.695 *		18475.3		53.9045 *	74.3649 *	33.23 *	223.746
29-118-WR1-B	1597.42		30640.3	1005.24	1129.28	800.655 *	56202		208.289	57.0975 *	33.3078 *	30.4252
29-118-WR1-C			5807.2	1277.94	202.415 *	280.054 *	20193.8			92.8063 *	30.7337 *	171.347
29-118-WR2-A	504.778 *	31283.8	10473.4	1591.62	510.754	311.13 *	15889.1			32.7168 *		253.367
29-118-WR2-B			4691.17	188.85 *	256.519 *		4874.93					61.4908
29-118-WR3-A		25914	7677.33	1443.6	238.535 *	304.846 *	21137.2		47.7326 *	164.437		343.641
29-118-WR3-A			7677.33	1443.6	238.535 *	304.846 *	21137.2		47.7326 *	164.437		343.641
29-118-WR3-B			8075.08	2302.58	253.481 *	399.348 *	28444.6		69.3188 *	156.449		251.899
29-118-WR4-A			13021.2	3790.03		1361.38	65201		92.8237 *	116.682 *	39.5936 *	80.4517
29-118-WR4-B			11909.1	3748.92		1247.29 *	54125.1		57.2054 *	105.513 *		83.3862
29-118-WR-1-COMP	869.588 *		23647.3	2306.29	635.271	583.779 *	36546.1		77.559 *	96.3041 *	38.5549 *	239.664
29-118-WR-2-COMP	566.641 *		11262.2	2514.93	246.128 *	656.41 *	37057.3		67.1975 *	133.931 *		197.253
29-118-WR-SS-1			7523.04	2672.54		1045.65 *	33051.1		63.6771 *	77.401 *	40.1214 *	97.3674

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
29-118-SE-3	266.425			43.5454 *	115.486			891.299	117.258 *		15.102 *
29-118-WR1-A	227.97				86.5922			487.242			21.2218 *
29-118-WR1-B	42.8265				19.6903 *			71.8772			8.8716 *
29-118-WR1-C	105.098		6.51262 *	40.1963 *	134			468.359			34.9952
29-118-WR2-A	90.447			32.679 *	171.268			289.292			15.4774 *
29-118-WR2-B	19.9691				158.31			115.772			18.3686 *
29-118-WR3-A	287.197		9.65714 *		94.1669			679.635			26.4097
29-118-WR3-A	287.197		9.65714 *	114.795	94.1669			679.635			26.4097
29-118-WR3-B	286.716		61.0262	133.661	138.057			876.869			23.6175 *
29-118-WR4-A	216.368				106.733			610.239			28.8189
29-118-WR4-B	286.758				102.039			1026.53	78.9203 *		20.9727 *
29-118-WR-1-COMP	331.292			24.701 *	105.469			669.392			24.0006
29-118-WR-2-COMP	265.131			22.6292 *	118.101			635.398			21.1572 *
29-118-WR-SS-1	265.278				99.1246			1098.35	81.9009 *		28.3625

* – Estimated Quantity
$ – Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

PACIFIC
PA NO. 29-118

AIMSS SCORESHEET

SITE NAME: PACIFIC
PA NUMBER: 29-118

GROUNDWATER PATHWAY

LINE NO.				
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	21.772
6	GW - TARGETS	WELLS - 1 MI. x 2.5		0.0
7		WELLS - 1 TO 4 MI		6
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	6.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	52253

SURFACE WATER PATHWAY

11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	700
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	22.903
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		26
18		WETLANDS		10
19		FISHERY		0
20		RECREATION		0
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	38
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	609220

AIR PATHWAY

25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.080
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31		WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	10
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	40

DIRECT CONTACT PATHWAY

36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		0
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.072
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		1
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 THRU 42	1
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	7

45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000	**6.62**

			SITE NAME:	PACIFIC
LINE NO.		**SITE SAFETY**	PA NUMBER:	29-118
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	150
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	75
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	225
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 THRU 11	1
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**4.50**

SUMMARY OF HISTORICAL ANALYTICAL DATA
FROM OTHER SOURCES

MDSL AMRB/PIONEER 4/9/93

DATE: November 15, 1990

CLIENT: Abandoned Mines

FIELD ID: Pacific Mine Adit #1

LAB NO: W8853

DATE RECEIVED: 10/16/90

Hardness 207 mg/L as $CaCO_3$

Total Metals

As <0.1 mg/L

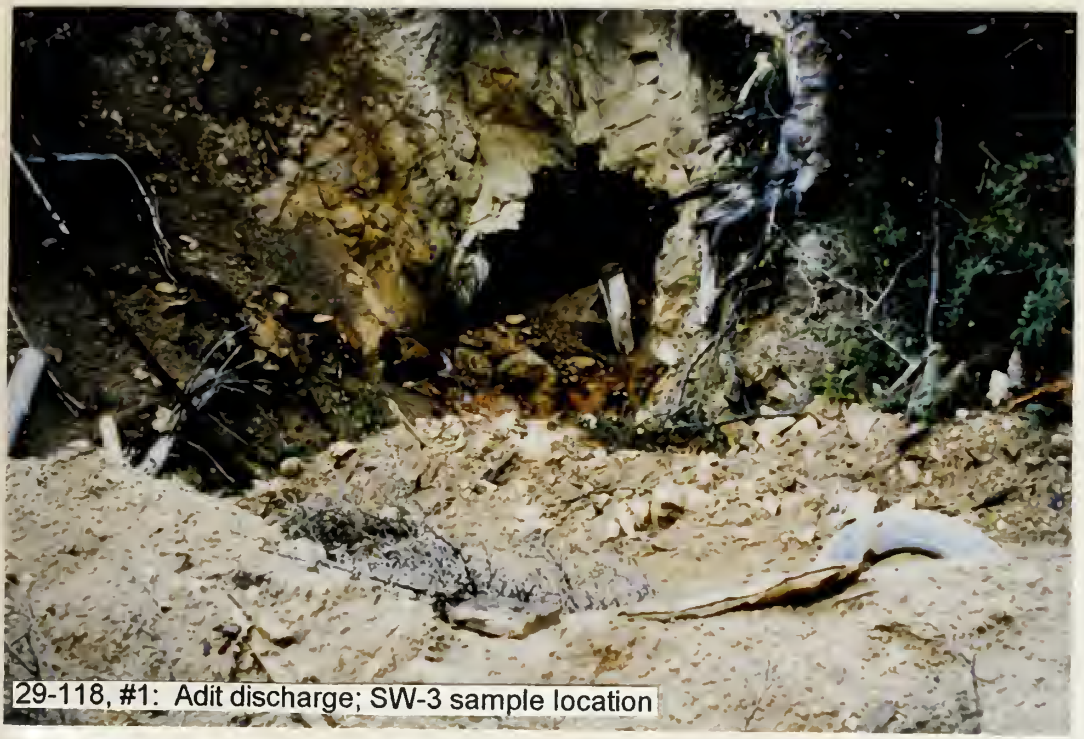
Cd <0.005 mg/L

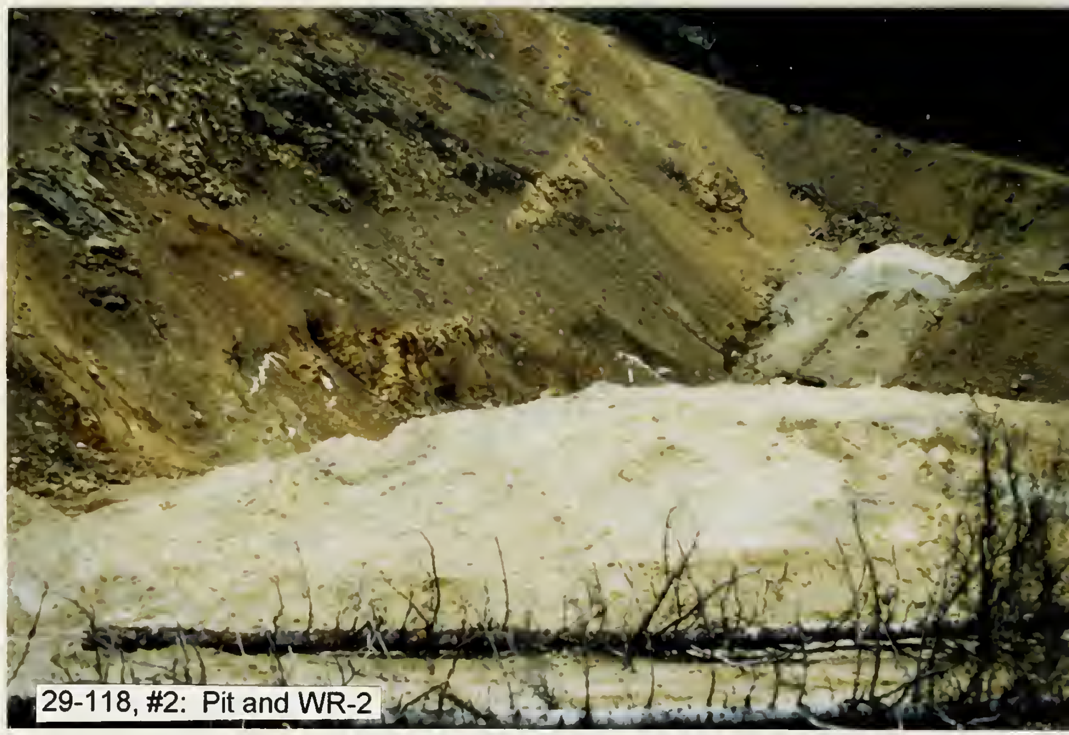
Cu <0.02 mg/L

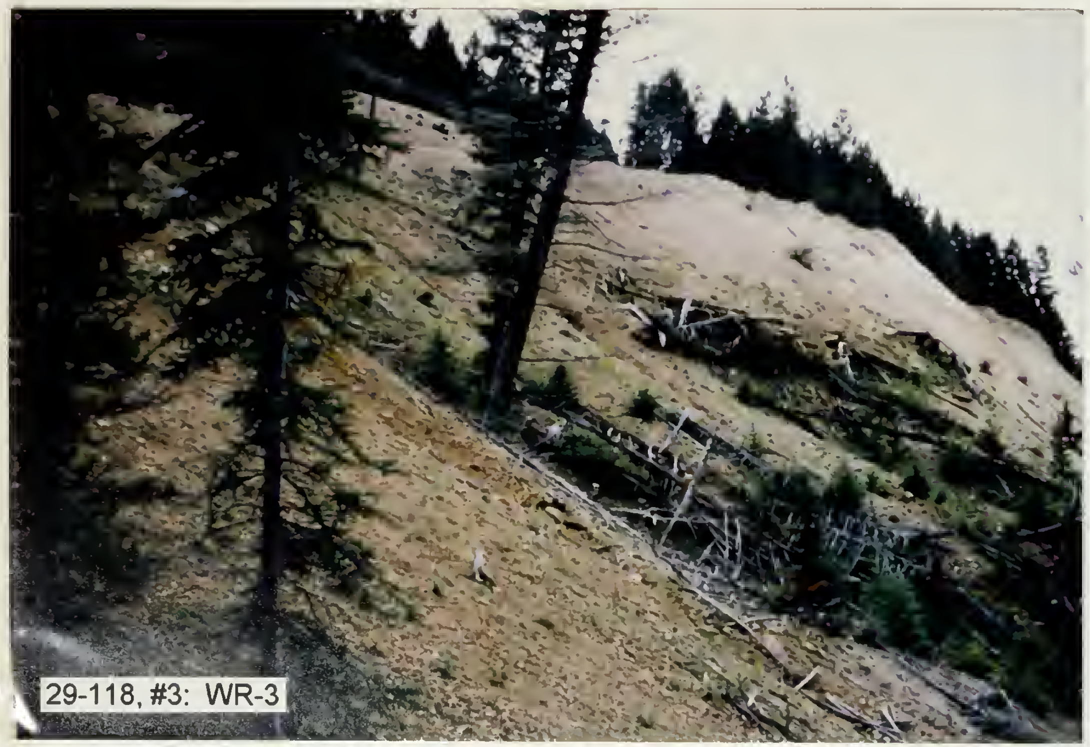
Fe 0.59 mg/L

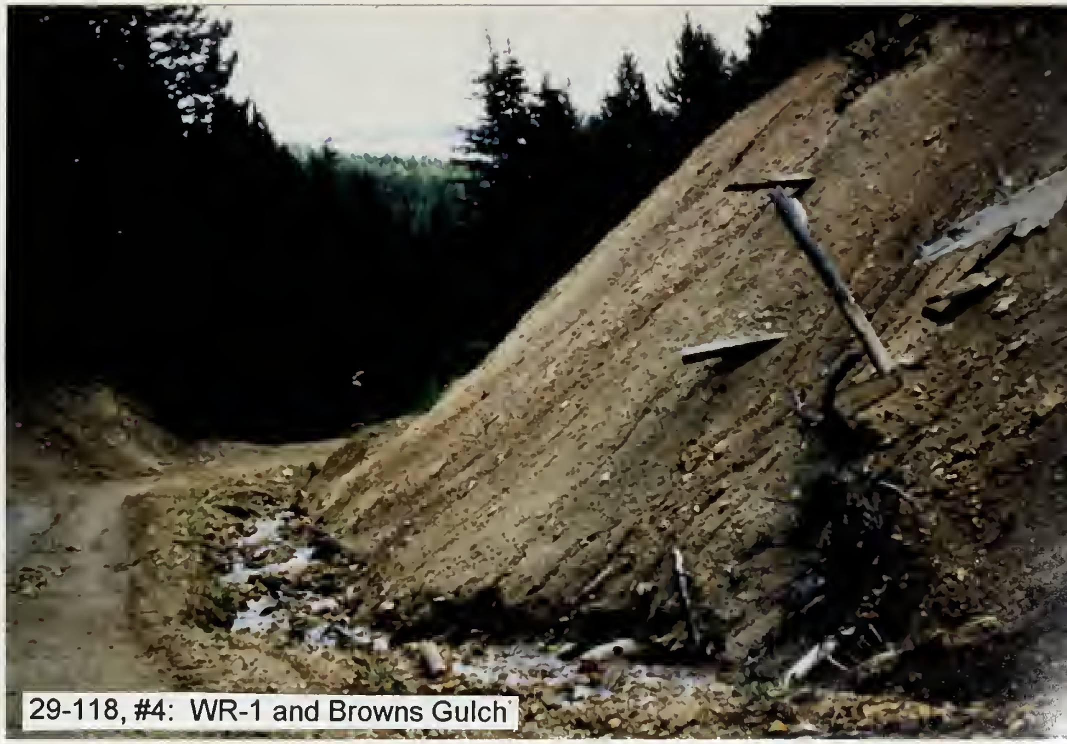
Pb <0.07 mg/L

Zn 0.02 mg/L


29-118, #1: Adit discharge; SW-3 sample location


29-118, #2: Pit and WR-2


29-118, #3: WR-3


29-118, #4: WR-1 and Browns Gulch

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: EASTON PA#: 29-121

Date: August 26, 1993 Time: 1330

Field Team Leader: Babits, Pioneer

Sampling Personnel: Flammang, Pioneer
Pierson, TD&H

Visitors: None

Weather/Seasonality Observations: Partly cloudy to sunny; 50° to 70°F; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #5: WR-1 with tributary; #6: WR-2, loadout, and tributary; #7: TP-1.
Video Tape No. 3

General Comments/Observations (not covered specifically in attached Inventory Forms): Tailings were identified in vegetated flat area southwest of the site. Tailings are believed to predate the Easton mine.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Tailings are presently vegetated with 75% vegetation, but do contain elevated metals for reprocessing. Waste rock needs to be bermed from creek and revegetated. Adit discharge is near neutral pH with no metals elevated; no treatment needed at this time.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): EASTON PA#: 29-121

Legal Description: T 7S ;R 3W ;Sec. 4 , SE1/4SE 1/4 ___1/4

County: MADISON Mining District: VIRGINIA CITY

Latitude: N 45° 15' 00" Longitude: W 111° 58' 01"

Primary Drainage Basin and Code: Alder Gulch/10020003
Secondary Drainage Basin: Browns Gulch

USGS Quadrangle map name(s): Virginia City/Cirque Lake

Mine Type/Commodities: Hardrock/Gold, Silver

Activity Status: Active___, Inactive/Exploration___, Abandoned X .

Ownership status: Known YX N__; private/public? Private
Owner, Agent, or Contact (Include address and phone when available): Easton Pacific and Riverside Mining Co., P.O. Box 1011, St. Cloud, MN 56301.

Relationship to other mines/sites in the area/district: Somehow connected underground with the East Pacific mine (Easton shaft) approx. 3/4 mile upgradient.

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? Topsoil may have been put over parts of the tailings.

General site features: Elevation 6800', Slope 5°-10°,
Aspect Northwest

Land use: Mining X , Recreational___, Residential___, Urban___,
Agricultural X , Other(Specify)___

Area of disturbed/unvegetated lands? 1.5 acres.
Dimensions:___

Predominant vegetation types: Sage brush, grasses, Douglas fir

Access: roads - good X , poor___, 4wd___, trail___.
Other logistical considerations (proximity to other sites).
East Pacific 3/4 mile up road; Pacific approx. 3 miles away.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site lies on the west side of unnamed tributary to Browns Gulch, which flows north through the site. The site is underlain by Precambrian schists which have been cut by an intrusion of quartz monzonite apalite.

Mining/milling history, ore type/tenor, host rock, gangue: Identified as the Pacific mine in some of the early literature available. Easton mine reported in 1873 to contain 1 oz. Au to 30-40 oz. Ag. Vein contained antimonial silver sulfides carrying gold with free silver in quartz and iron oxides. Ore minerals included free gold, auriferous pyrite, tetrahedrite, sphalerite, stibnite, and argentite.

Mine Operation?

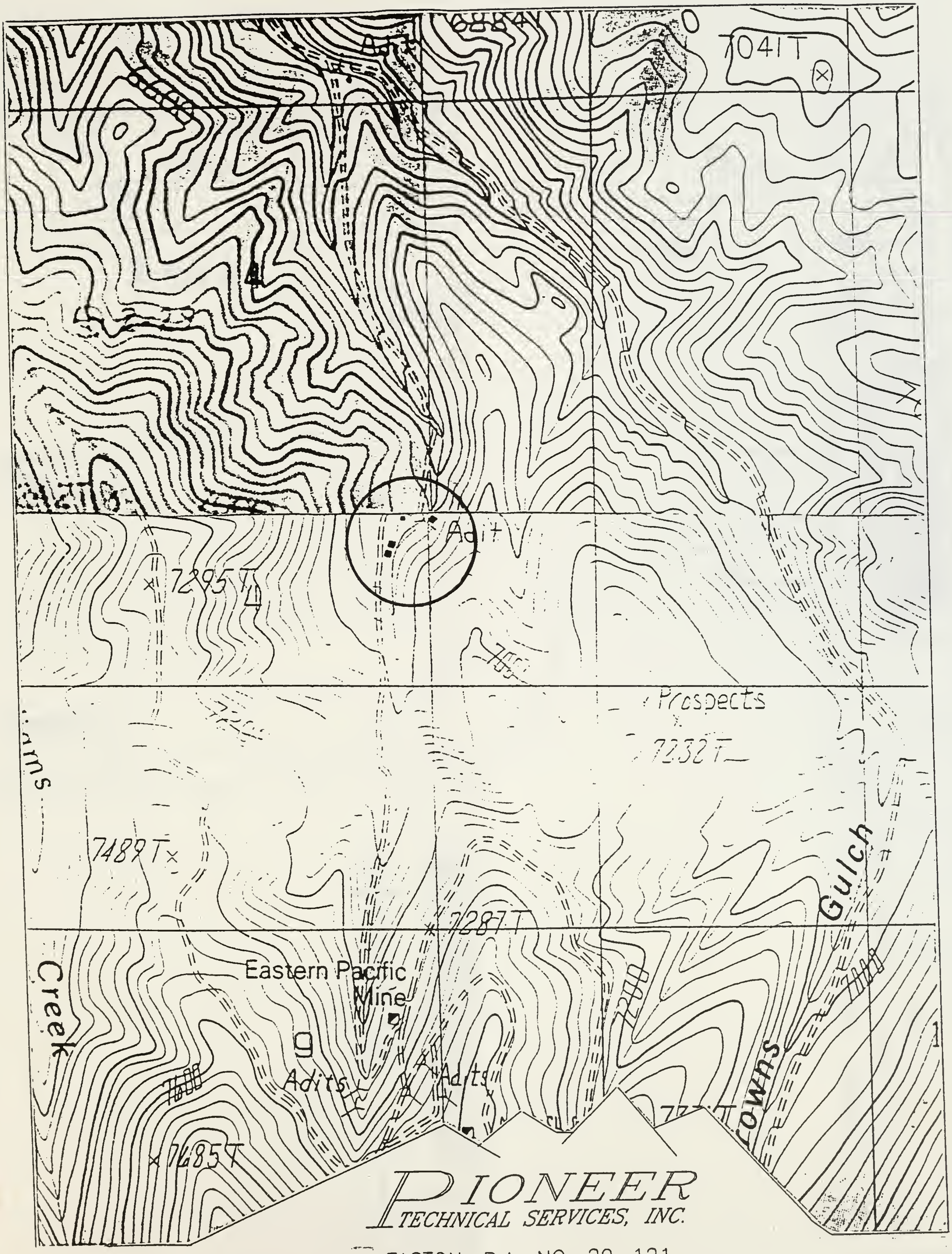
Shafts -	Yes___,	No X ,	# ____,	Comment
Adits -	Yes X ,	No___,	# 1 ,	Comment Open; blocked by dirt
Pits -	Yes___,	No X ,	# ____,	Comment
Placers -	Yes___,	No X ,	# ____,	Comment
Other -	Yes___,	No X ,	# ____,	Comment

Mill Operation? Yes X , No____. If yes answer the next three questions:

Period(s) of Operation: Unknown

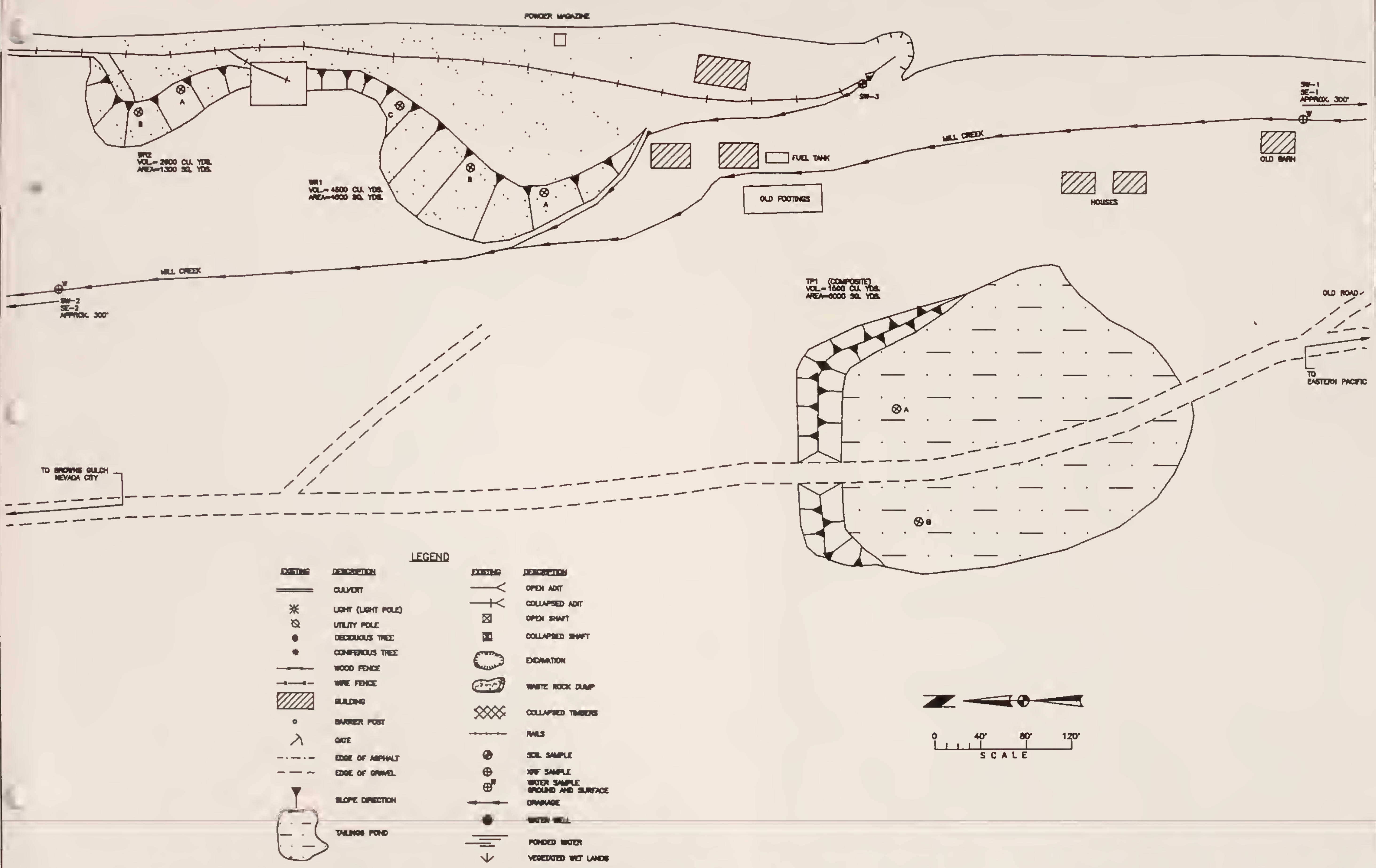
Origin of Ore Milled - Custom Mill___ Dedicated Mill___; Number and names of mines that supplied mill feed: Unknown

Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting?
Cyanide leach



PIONEER
TECHNICAL SERVICES, INC.

EASTON, P.A. NO. 29-121
T07S, R03W, SECTION 04
SCALE: 1" = 1000'



DRAWN	JTP
DESIGN	TPR
APPROVED	WJB
DATE	27 OCT 93
JOB NO.	93-17
F.B. NO.	

PIONEER

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL MONTANA
SPOKANE WASHINGTON

TD&H

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

EASTON PA# 29-121
VIRGINIA CITY DISTRICT MADISON COUNTY

SHEET NO.

29-121.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): 100% brown, gray, and red fine-grained sand

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): 8" average depth over area

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Dry

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): Breached; well vegetated

Comments on potential for mitigation: Spot seeding and fencing to keep cattle out until vegetation takes hold.

SOURCE INVENTORY FORM

SAMPLERS: Babits, Pierson

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
WR-1A	WR	4,500	South end of WR-1	None	6.4 (D)	0.09	29-121-WR-1	08/26/93 1800	T-Metals, ABA
WR-1B	WR		Just south of WR-1C	None	6.2 (D)	0.05			
WR-1C	WR		North end of WR-1	None	6.6 (D)	0.09			
WR-2A	WR	2,600	On south side of WR-2	None	5.8 (D)	0.05			
WR-2B	WR		Just off knob of WR-2	None	5.4 (D)	0.05			
TP-1A	TAIL	1,500	0"-6", red fine sand	Breached dam	6.6 (D)	0.05	29-121-TP-1	08/26/93 2030	T-Metals, ABA, CN-
TP-1B	TAIL		6"-12", gray and red fine sand	Breached dam	6.6 (D)	0.06			
TP-1C	TAIL		12"-14", underlying soil; brown loam	Breached dam	6.6 (D)	0.05			

* D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 29-121-WR-1 is composite of WR-1A through -1C, and WR-2A and -2B. 29-121-TP-1 is composite of TP-1A-A and TP-1A-B. See Pacific (29-118) for background soil sample.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map oı topographic map.

Flowing adits: Yes X , No___, Number: 1 Identification: Adit #1

Filled shafts: Yes___, No X , Number:____ Identification:____

Seeps/Springs: Yes X , No___, Number: 1 Identification: Very small seep from the base of WR-2.

Groundwater wells within 4 miles?: Yes X , No___;
Number of well logs: 84

Distance to nearest well used for drinking? Approx. 4 miles

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible X , Unlikely____.
Groundwater in contact with probable ore; however, metal values from dumps are fairly low.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: Flammang

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-3	AD	Discharge from Adit #1	0.03 cfs (M)	7.50	768	243	7.4	559	N/A	29-121-SW-3	08/26/93 1455	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X , No ___, Name(s): Unnamed tributary to Browns Gulch

Dry streambeds: Yes ____, No X , Name(s): ____

Other surface water: Yes ____, No X , Name(s)/Description: ____

Waste materials within any floodplain: Yes X , No ___ Source ID(s): WR-2

Approximate Flood frequency? X 1 yr, ___10 yr, ___100 yr

Estimated seasonal flow of stream(s) (cfs)? 0.12 during investigation
High Flow: 2 cfs , Average Flow: 0.2 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet; toe of WR-2 is in creek.

Surface water draining onto or through waste sources: Yes X , No ____,
Describe: Creek flows over toe of WR-2; runoff.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Irrigation, agriculture, mining

Observed erosional/sedimentation/stream turbidity problems? Yes X , No _____, Distance downstream (ft)? 50+ Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Waste rock debris is present in sediment; however, larger dump upstream (Easton Pacific) is also impacting the stream; visually, waste rock looks alike.

SURFACE WATER INVENTORY FORM

SAMPLERS: Flammang

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow' cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	50 feet upgradient above last cabin	8.20	319	233	10.0	97	0.12 cfs (M)	29-121-SW-1	08/26/93 1415	T-Metals, TDS, Hardness, Cl-, SO4, NO2/NO3
SE-1	SE	50 feet upgradient above last cabin	N/A	N/A	N/A	N/A	N/A	N/A	29-121-SE-1	08/26/93 1415	T-Metals
SW-2	SW	Downgradient of WR-2	8.12	423	312	9.8	247	0.114 cfs (M)	29-121-SW-2	08/26/93 1545	T-Metals, TDS, Hardness, Cl-, SO4, NO2/NO3
SE-2	SE	Downgradient of WR-2	N/A	N/A	N/A	N/A	N/A	N/A	29-121-SE-2	08/26/93 1545	T-Metals
SE-3	SE	500 feet downgradient of WR-2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis
SE-4	SE	1,000 feet downgradient of WR-2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ______

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? The site area, approx. 3.25 acres

Wetlands present: Yes___, No X , Describe:

Carbonate rocks/soils: Yes___, No X , Describe: None seen on-site; however, limestone is in the area.

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30 X ; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence(ft or miles)? 4 to 4.5 miles

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits, Flammang, Pierson

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	None	Dry	40,500	40,500	No	Low
WR-2	None	Dry	11,700	11,700	No	Low
TP-1	None	Dry	54,000	13,500	Yes	Low
Adit #1	None	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No_X_, Describe:______

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments_None_

Evidence of recreational use on site: Yes___, No_X_, Describe:______

Accessibility - Fences, warning signs, closed roads?_Unrestricted_

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment______
Wilderness Area - Yes___, No_X_, Comment______
T&E Species Habitat - Yes___, No_X_, Comment______
Bat Habitat - Yes___, No_X_, Comment______

Primary Drainage___; Secondary Drainage_X_; No Information___:

Riparian Habitat Quality - High_X_, Medium___, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _4_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_1_, types and locations: Adit #1 has dirt piled in front of opening, but is still fairly easy to access; inclined adit.

Hazardous structures: Yes_X_, No___, Number_6_, types and locations: Three old sheds; two old collapsing houses; one collapsing barn.

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____, types and locations:______

Unstable waste piles, impoundments, undercut banks: Yes_X_, No____, Number_2_, types and locations: WR-1 and -2 have steep, unvegetated slopes.

Fire and/or Explosion hazards: Yes_X_, No___, Explain: Wood buildings

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB, Environmental Assessment Analytical Data for the Easton mine, Prepared by MSE, Inc., November 15, 1990.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Easton, Northern Engineering and Testing, August 20, 1987.

USBM, Gold Lode Mining in the Tobacco Root Mountains, Madison County, Montana, Information Circular 6972, Written by S.H. Lorain, November 1937, pp. 56-57.

USGS, Mining Districts of the Dillon Quadrangle, Montana and Adjacent Areas, Bulletin 574, Written by Alexander N. Winchell, 1914, pp. 158-165.

USGS, Topographic Map, Virginia City and Cirque Lake, Montana, 7 1/2 minute Quadrangles, 1988.

LABORATORY ANALYTICAL DATA

EASTON
PA NO. 29-121

Easton PA# 29−121
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER − BABITS
INVESTIGATION DATE: 08/26/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29−121−SE−1	4.56 U	33.4 J	0.88 UJ	3.2	9.06 JX	5.67	11200	0.035 J	98.4 J	6.86 JX	7.67 JX	6.04 UJ	38.9 J	NR
29−121−SE−2	5.48 U	23.1 J	1.05 UJ	2.08	6.91 JX	6.93	8320	0.034 J	125 J	5.7 JX	14.3 JX	7.24 UJ	60.2 J	NR
29−121−TP−1	52.9	455 J	45.20 J	6.43	10.6 JX	489	27900	1.47 J	273 J	22.9 JX	2670 JX	107 J	3650 J	<0.306
29−121−WR−1	25	257 J	1.87 J	10.5	10.6 JX	111	30100	0.18 J	406 J	25.6 JX	94.2 JX	11.8 J	158 J	NR
BACKGROUND	12.8	123 J	1.02 UJ	8.77	22.4 JX	26.4	22400	0.030 UJ	539 J	16.4 JX	7.26 UJX	7.01 UJ	52.4 J	NR

U − Not Detected; J − Estimated Quantity; X − Outlier for Accuracy or Precision; NR − Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
29−121−TP−1	1.23	38.4	47.1	8.69	0.48	0.74	0.01	23.1	24
29−121−WR−1	0.66	20.6	62	41.4	0.13	0.34	0.19	10.6	51.4

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29−121−SW−1	1.12 U	73	4.59 U	5 U	6.24 U	2.33 U	296 J	0.22	11.8	10.9 U	3.18	31.7 U	8.71 U	129
29−121−SW−2	1.12 U	78.4	4.59 U	5 U	6.24 U	2.33 U	270 J	0.2	11	10.9 U	3.78	31.7 U	19.7	360
29−121−SW−3	1.32	55	4.59 U	5 U	6.24 U	3.8 J	51.9 J	0.27	5	10.9 U	0.99	31.7 U	34.1	814

U − Not Detected; J − Estimated Quantity; X − Outlier for Accuracy or Precision; NR − Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2−N	CYANIDE
29−121−SW−1	164	< 5.0	39	< 0.05	NR
29−121−SW−2	403	< 5.0	116	0.16	NR
29−121−SW−3	901	< 5.0	249	< 0.05	NR

LEGEND

SE1 − 50 feet upgradient above last cabin.
SE2 − Downgradient of waste rock dump 2.
TP1 − Composite of subsamples TP1A and 1B.
WR1 − Composite of subsamples WR 1A, 1B, 1C, 2A, and 2B.
BACKGROUND − From the Pacific Mine (29−118−SS−1).

SW1 − Same as SE1.
SW2 − Same as SE2.
SW3 − Discharge from adit #1.

XRF ANALYSIS RESULTS

EASTON
PA NO. 29-121

Mine Name: Easton PA# 29-121
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
29-121-SE-3		13284	9205.93	2092.22	244.824 *	480.141 *	25239.7		46.5814 *	164.045		133.984
29-121-SE-4		11417.8	12462.2	1992.03		562.128 *	25001.8			141.12 *		151.09
29-121-TE												
29-121-TP1-A		13580.9	8331.86	337.643 *	126.019 *		13574.2		256.503	1425.76		376.213
29-121-TP1-B		13335.8	11332.5	283.689 *	176.478 *		22100.6		380.951	2551.62		820.38
29-121-TP1-C		18320.1	8780.44	2450	164.471 *	505.891 *	38111.1		85.8887 *	662.203		223.696
29-121-TP-1-COMP		12006.2	7166.26	276.553 *	146.923 *	297.802 *	14549.6		266.484	1537.81		446.048
29-121-WR1-A		29744.3	9703.16	1458.42		308.306 *	22724.5		111.306 *	245.387		315.743
29-121-WR1-B		35562.2	6803.44	3250.49		387.063 *	33144		123.639 *	303.84	61.4987 *	711.789
29-121-WR1-C		41963.7	2924.58	360.961 *	169.193 *		5284.89		56.097 *	94.8525 *		132.861
29-121-WR2-A		34171.1	7120.12	2164.58		494.837 *	46553.8		115.418 *	92.1396 *	53.5406 *	457.404
29-121-WR2-B		27038.2	19299.6	2461.41		417.4 *	21637.3			99.0186 *	30.8834 *	445.652
29-121-WR-1-COMP		38797.7	7753.51	2647.41		324.136 *	30033.8		131.654 *	199.707	51.4308 *	566.176

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
29-121-SE-3	232.358			44.7166 *	97.971			1036.59	81.0787 *		11.5177 *
29-121-SE-4	336.974			35.8082 *	82.6005			867.195			17.6194 *
29-121-TE											
29-121-TP1-A	71.2139		47.458	983.456	39.5023		53.4579 *	297.599	204.87 *		14.1377 *
29-121-TP1-B	77.5705		82.8988	1894.45	56.1929		89.7436 *	577.554	267.956		23.9827 *
29-121-TP1-C	245.719		18.008 *	186.949	105.912			694.576		21.7066 *	33.5976
29-121-TP-1-COMP	63.6173		56.4862	1155.52	39.3503 *		64.2805 *	316.694	224.351		16.7084 *
29-121-WR1-A	106.498		26.6932	199.092	119.589			800.53	88.1519 *		11.2706 *
29-121-WR1-B	130.056		5.16524 *	128.088	106.651			530.311		11.1431 *	20.503 *
29-121-WR1-C	49.9027		3.80821 *	46.5833 *	120.122		80.1333 *	151.386			9.13523 *
29-121-WR2-A	160.754				126.546			447.694	119.315 *		20.4668 *
29-121-WR2-B	189.678			37.7911 *	105.782			1038.78	77.1076 *	17.1276 *	24.729
29-121-WR-1-COMP	174.932		15.4682 *	195.973	133.535			843.674	83.0837 *		25.928 *

* – Estimated Quantity
$ – Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

EASTON
PA NO. 29-121

MDSL AMRB/PIONEER 4/9/93

AIMSS SCORESHEET

SITE NAME: EASTON
PA NUMBER: 29-121

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	3.802
6	GW - TARGETS	WELLS - 1 MI. x 2.5		0.0
7		WELLS - 1 TO 4 MI		84
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	84.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	127747
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	400
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	4.141
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		0
19		FISHERY		1
20		RECREATION		0
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 THRU 22	3
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	4969
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.328
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 THRU 33	20
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	328
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		0
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.297
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		0
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 THRU 42	0
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	0
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000			**1.33**

LINE NO.		**SITE SAFETY**	SITE NAME: PA NUMBER:	EASTON 29-121
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	240
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	290
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 THRU 11	0
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**0.00**

SUMMARY OF HISTORICAL ANALYTICAL DATA
FROM OTHER SOURCES

DATE: November 15, 1990

CLIENT: Abandoned Mines

FIELD ID: Easton Mine Discharge

LAB NO: W8855

DATE RECEIVED: 10/16/90

Hardness 704 mg/L as $CaCO_3$

Total Metals

As <0.1 mg/L

Cd <0.005 mg/L

Cu <0.02 mg/L

Fe 0.14 mg/L

Pb <0.07 mg/L

Zn 0.03 mg/L

DATE: November 15, 1990

CLIENT: Abandoned Mines

FIELD ID: Creek Below Easton Mine

LAB NO: W8854

DATE RECEIVED: 10/16/90

Hardness 370 mg/L as $CaCO_3$

Total Metals

As <0.1 mg/L

Cd <0.005 mg/L

Cu <0.02 mg/L

Fe 1.01 mg/L

Pb <0.07 mg/L

Zn 0.03 mg/L

DATE: November 7, 1990

CLIENT: Abandoned Mines

FIELD ID: Easton Tailings

LAB NO: S2778

DATE RECEIVED: 10/18/90

pH (1:1 slurry) 7.90 SU

Total Metals

As 90 mg/Kg

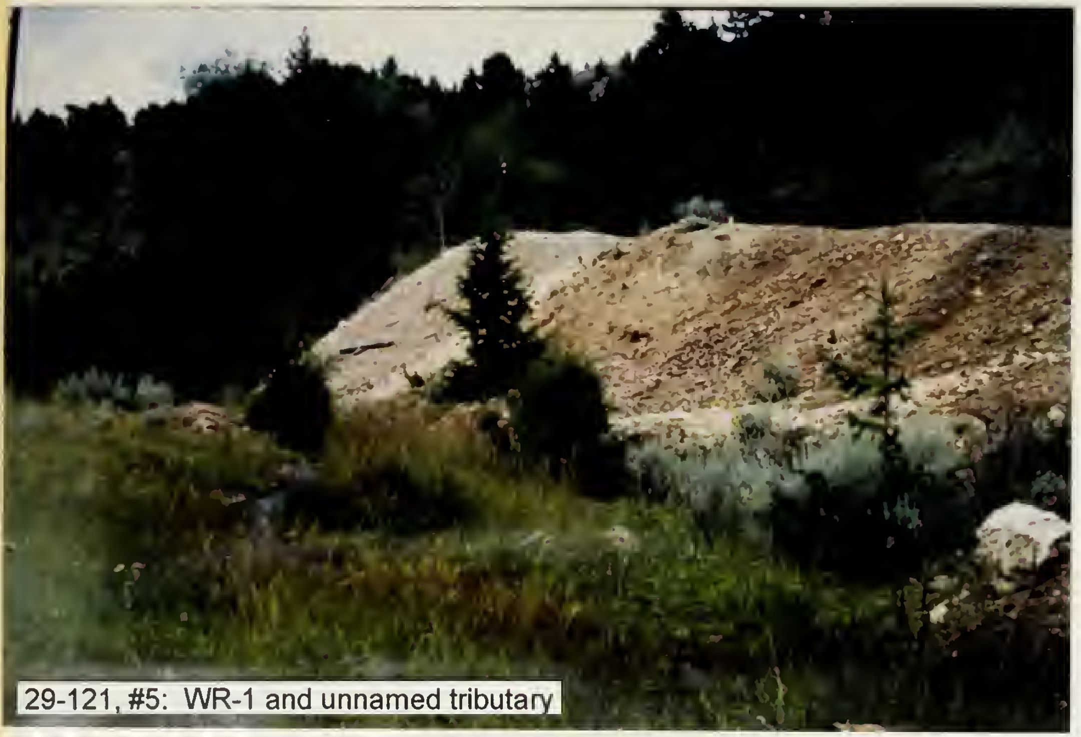
Cd 28.6 mg/Kg

Cu 384 mg/Kg

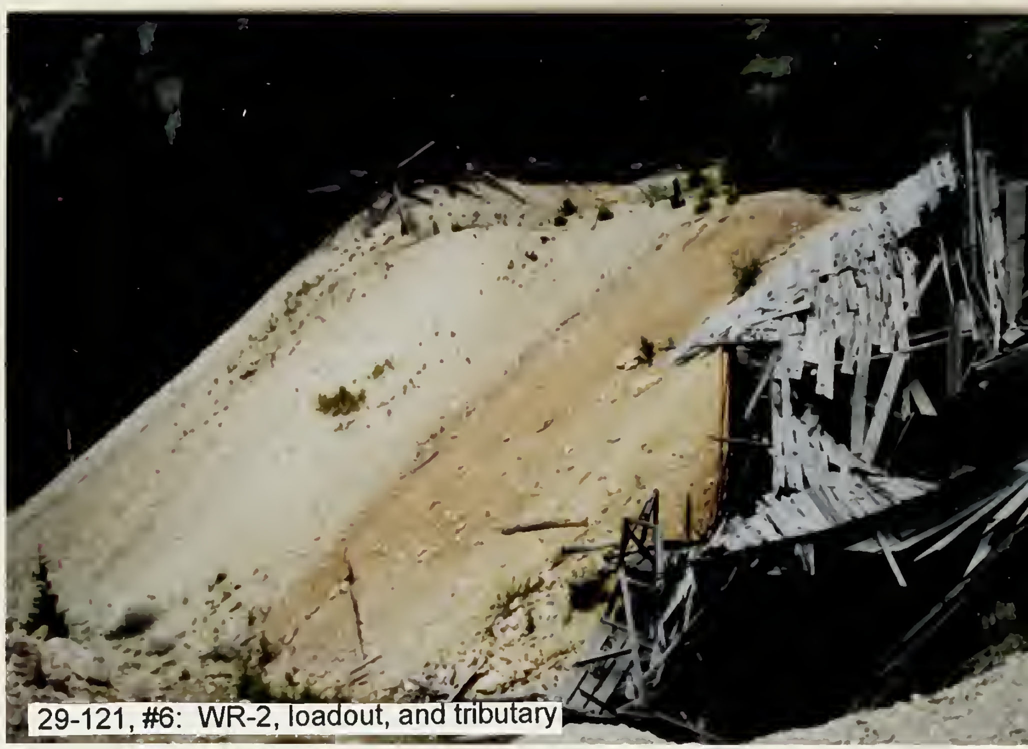
Fe 23.300 mg/Kg

Pb 1430 mg/Kg

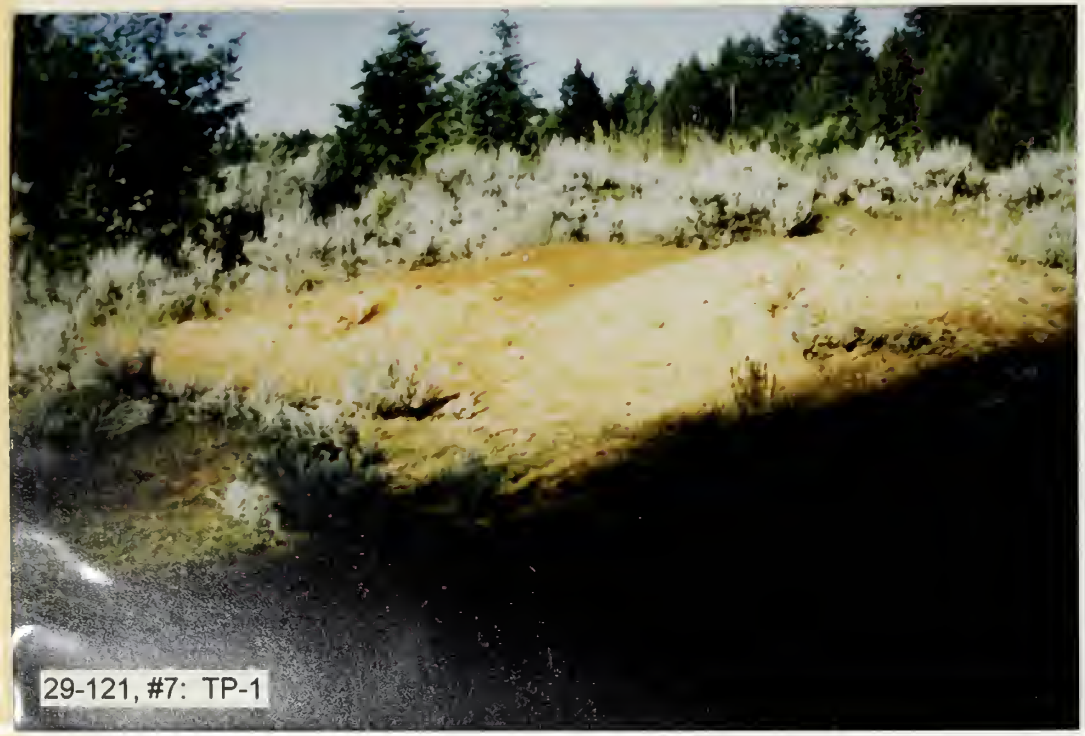
Zn 2040 mg/Kg



29-121, #5: WR-1 and unnamed tributary



29-121, #6: WR-2, loadout, and tributary



29-121, #7: TP-1

WASHINGTON

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: MISSOURI PA#: 29-373

Date: July 22, 1993 Time: 0900

Field Team Leader: Babits, Pioneer

Sampling Personnel: Pierson, TD&H
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Warm (55°F); overcast; no breeze; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #8: Looking north at upper pit and WR-2; #9: Looking south at WR-3 and Ennis; #10: Mill building; #11: Tailings. No video was taken.

General Comments/Observations (not covered specifically in attached Inventory Forms): Millsite is on South Meadow Creek. Mine with waste rock is 0.5 mile upgradient of the site to the northwest.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Fill upper pit with waste rock. Tailings are revegetated, but still contain metals; reprocess if desired. Some erosion into stream is occurring and should be bermed.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): MISSOURI PA#: 29-373

Legal Description: T 4S ;R 2W ;Sec. 30 , N 1/2 NE1/4 1/4
Sec. 29 , S 1/2

County: MADISON Mining District: WASHINGTON

Latitude: N 45° 27' 32" Longitude: W 111° 53' 27"

Primary Drainage Basin and Code: Madison River/10020007
Secondary Drainage Basin: South Meadow Creek

USGS Quadrangle map name(s): Ramshorn Mountain

Mine Type/Commodities: Hardrock/Gold, Silver, Lead, Copper

Activity Status: Active___,Inactive/Exploration___,Abandoned X .

Ownership status: Known YX N__; private/public? Private/Public
Owner, Agent, or Contact(Include address and phone when available): Gordon Austin, H.W. Goddard, and D.W. Hunt, 156 East 2nd Street South, Salt Lake City, UT 84111; Beaverhead National Forest.

Relationship to other mines/sites in the area/district: Unknown

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation Mine, 8600'; Mill, 7400' ,
Slope 10°-30° , Aspect Southeast

Land use: Mining___, Recreational X , Residential___, Urban___,
Agricultural___, Other(Specify)

Area of disturbed/unvegetated lands? 2 to 3 acres.
Dimensions:

Predominant vegetation types: Timber, shrubs, and grasses

Access: roads - good___,poor___,4wd X ,trail___.
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Ore bodies are flat-lying quartz veins on the contact between gneiss and a sill-like andesite intrusive. TP-1 lies within South Meadow Creek, which flows east away from the site. The Missouri mine lies on the north side and approx. 2,800 feet above the creek.

Mining/milling history, ore type/tenor, host rock, gangue: Operation began in 1905 and it is unknown when it ceased. Production from 1905 through 1936 (mine inactive) was 16,664 oz. Au, 41,958 oz. Ag, with credits of Cu and Pb from 14,340 tons of ore.

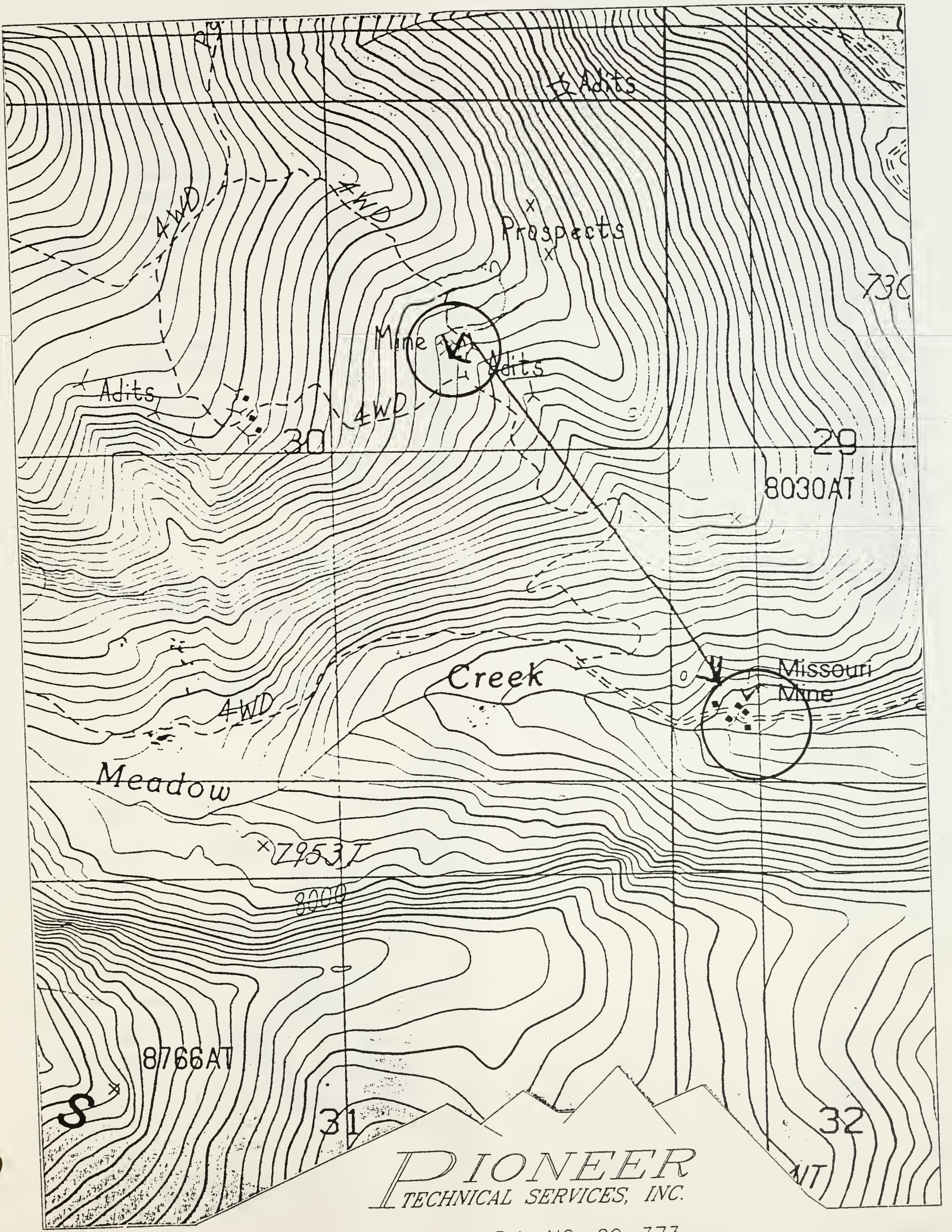
Mine Operation?
Shafts - Yes___, No_X_, # ____, Comment
Adits - Yes_X_, No___, # _7_, Comment 1 open, mine; 1 open, mill
Pits - Yes_X_, No___, # _1_, Comment At mine
Placers - Yes___, No_X_, # ____, Comment
Other - Yes___, No_X_, # ____, Comment

Mill Operation? Yes_X_, No___. If yes answer the next three questions:

Period(s) of Operation: Unknown

Origin of Ore Milled - Custom Mill___ Dedicated Mill___; Number and names of mines that supplied mill feed: Unknown

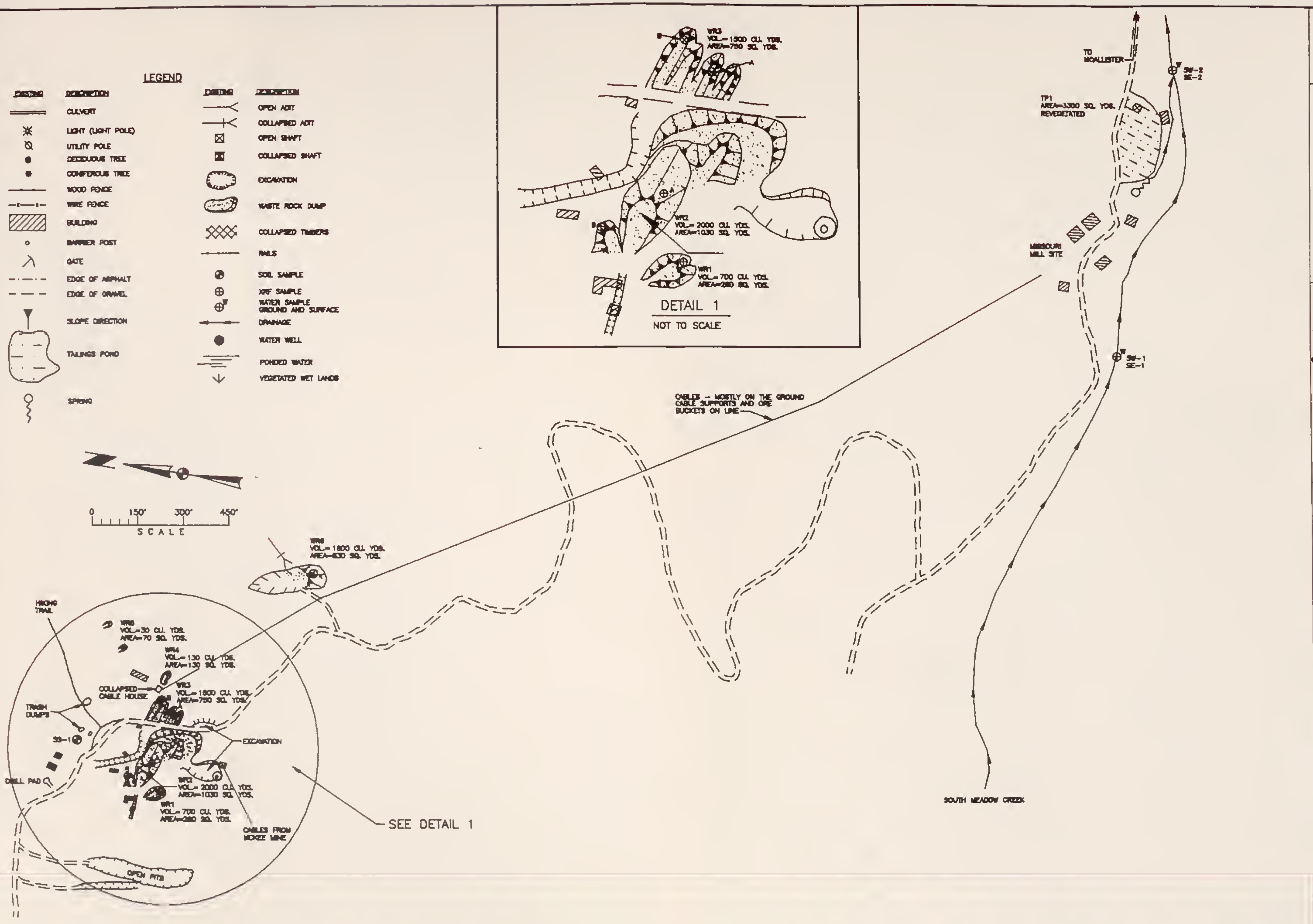
Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting? 35-ton amalgamation, gravity, and cyanide plant



PIONEER
TECHNICAL SERVICES, INC.

MISSOURI, P.A. NO. 29-373

T04S, R02W, SECTION 30
SCALE: 1' = 1000'



DRAWN JTP DATE 28 OCT 93
DESIGNED TPR JOB NO. 93-17
APPROVED WJB F.B. NO.

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL MONTANA
SPOKANE WASHINGTON

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY
MISSOURI PA# 29-373
WASHINGTON DISTRICT MADISON COUNTY

SHEET NO.

29-373.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): Sand with clay lenses

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): A wood dam holds tailings approx. 11 feet deep.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Moist

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): Wood dam is rotten and is non-existent in spots.

Comments on potential for mitigation: Already well vegetated; isolate tailings from stream.

SOURCE INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd³)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
TP-1A-A	TAIL	12,111	East end of TP-1, borehole; 10"-2', light orange sand	None	6.4 (D)	0.04	29-373-TP-1	07/22/93 1900	T-Metals, ABA, CN-
TP-1A-B	TAIL		East end of TP-1, borehole; 2-3', light orange sand/clay	None	6.0 (D)	0.04			
TP-1A-C	TAIL		East end of TP-1, borehole; 3-10', tan sand	None	6.8 (D)	0.05	29-373-TP-2	07/22/93 1900	T-Metals, ABA, CN-
TP-1A-D	TAIL		East end of TP-1, borehole; 9-11', tan sand	None	6.8 (D)	0.04			
WR-1	WR	700	East of north end of upper open pit; southeast end of pile	None	6.8 (D)	0.05	29-373-WR-1	07/22/93 1900	T-Metals, ABA
WR-2A	WR	2,000	Northeast of WR-1; off east end of large lobe	None	6.8 (D)	0.04			
WR-2B	WR		Northeast of WR-1; east end of small lobe	None	6.8 (D)	0.04			
WR-3A	WR	1,600	East of road; on top of second lobe from the south	None	6.8 (D)	0.06			
WR-3B	WR		East of road; on top of northern most pile	None	6.8 (D)	0.05			
WR-4	WR	130	Associated with cable house; southeast side	None	6.8 (D)	0.04	29-373-WR-2	07/22/93 1830	T-Metals, ABA
WR-5	WR	30	50 feet northeast of can dump; southeast side of dump	None	6.8 (D)	0.04			
WR-6	WR	1,600	350 feet below WR-4; east end of dump	None	6.8 (D)	0.05			
SS-1	BKGRND	N/A	Background soil	N/A	N/A	N/A	29-373-SS-1	07/22/93 1015	T-Metals

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 29-373-WR-1 is composite of WR-1, WR-2A and -2B, WR-3A and -3B. 29-373-WR-2 is composite of WR-4 through -6. 29-373-TP-1 is composite of TP-1A-A and -1A-B. 29-373-TP-2 is composite of TP-1A-C and -1A-D. ND = Not Determined

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No_X_, Number:____ Identification:______________

Filled shafts: Yes___, No_X_, Number:____ Identification:______________

Seeps/Springs: Yes___, No_X_, Number:____ Identification:______________

Groundwater wells within 4 miles?: Yes_X_, No___;
Number of well logs: 17

Distance to nearest well used for drinking? 4 miles

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable_X_, Possible____, Unlikely____.
Uncontained sources with some waste rock dumps and all of the tailings piles containing elevated metal values. Tailings in floodplain are probably in contact with shallow groundwater.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: ____________________

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC μS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.												

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________________

MDSL AMRB/PIONEER 4/9/93

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No ___, Name(s): South Meadow Creek

Dry streambeds: Yes ___, No X, Name(s): ___

Other surface water: Yes ___, No X, Name(s)/Description: ___

Waste materials within any floodplain: Yes X, No ___ Source ID(s): TP-1 is in South Meadow Creek.

Approximate Flood frequency? X 1 yr, ___ 10 yr, ___ 100 yr

Estimated seasonal flow of stream(s) (cfs)? 150 during investigation
High Flow: 1,600 cfs, Average Flow: 160 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes ___, No X,
Describe: ___

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Irrigation, fishery, wetland

Observed erosional/sedimentation/stream turbidity problems? Yes ___, No X, Distance downstream (ft)? ___ Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): None were observed during this investigation.

SURFACE WATER INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	800' upgradient of TP-1 in South Meadow Creek	7.79	NM	130	7.8	22	150 cfs (E)	29-373-SW-1	07/22/93 1330	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	800' upgradient of TP-1 in South Meadow Creek	N/A	N/A	N/A	N/A	N/A	N/A	29-373-SE-1	07/22/93 1330	T-Metals, CN-
SW-2	SW	At PPE of TP-1 in South Meadow Creek	7.86	NM	138	7.8	22	150 cfs (E)	29-373-SW-2	07/22/93 1235	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-2	SE	At PPE of TP-1 in South Meadow Creek	N/A	N/A	N/A	N/A	N/A	N/A	29-373-SE-2	07/22/93 1235	T-Metals, CN-

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): NM = Not Measured

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? (SO_3)

Presence of evaporative salt deposits? (ESD)

Discolored or turbid seepage? (SPG)

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? (FEOX)

Presence of burned or stressed vegetation? (VEG)

pH ≤ 5.0 (pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? None

Wetlands present: Yes___, No X , Describe:

Carbonate rocks/soils: Yes X , No___, Describe: Carbonate precipitate

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30 X ; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence(ft or miles)? 4 miles

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
TP-1	None	Dry	29,700	6	No	None
WR-1	SO3	Moist	2,520	2,520	Yes	Low
WR-2	SO3	Moist	9,270	8,343	Yes	Low
WR-3	SO3	Moist	6,750	6,075	Yes	Low
WR-4	SO3	Moist	1,170	1,170	Yes	Low
WR-5	SO3	Moist	630	315	Yes	Low
WR-6	SO3	Moist	5,670	2,835	Yes	Low

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No_X_,
Describe:__________

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___;
300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments None

Evidence of recreational use on site: Yes_X_, No___, Describe:
Tourists seen during this investigation.

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment__________
Wilderness Area - Yes___, No_X_, Comment__________
T&E Species Habitat - Yes_X_, No___, Comment Bald Eagle
Bat Habitat - Yes_X_, No___, Comment Adits

Primary Drainage___; Secondary Drainage_X_; No Information___:

Riparian Habitat Quality - High_X_, Medium___, Low___
Wetlands Frontage - High_X_, Medium___, Low___
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _3_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_2_, types and locations:
One adit at mine and one adit at the mill

Hazardous structures: Yes___, No_X_, Number____, types and locations:__________

Unstable highwalls, pits, trenches, slopes: Yes_X_, No___, Number_1_,
types and locations: Pit at mine

Unstable waste piles, impoundments, undercut banks: Yes____, No_X_,
Number____, types and locations:__________

Fire and/or Explosion hazards: Yes___, No_X_, Explain:__________

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Missouri, Prepared by Chen-Northern, July 22, 1989.

USBM, Gold Lode Mining in the Tobacco Root Mountains, Madison County, Montana, Information Circular 6972, Written by S.H. Lorain, November 1937.

USGS, Topographic Map, Ramshorn Mountain, Montana, 7 1/2 minute Quadrangle, 1988.

LABORATORY ANALYTICAL DATA

MISSOURI
PA NO. 29-373

Missouri PA# 29-373
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BABITS
INVESTIGATION DATE: 07/22/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-373-SE-1	16	86.7	0.5 U	8.5	38.1	17.6	13000	0.054	362 J	22	42	6 U	57	0.323 U
29-373-SE-2	290	68.6	0.6 U	11	41.2	45.3	20300	0.089	249 J	32	536	9	99	0.397 U
29-373-TP-1	6520	92.7	10.6	8	51.5	692	79100	3.68	138 J	18	11900	107	1080	0.317
29-373-TP-2	3390	35.2	3.6	4.3	24.5	364	44000	0.791	76.1 J	8	6680	76	426	0.308
29-373-WR-1	1730	103	9.8	28.5	34.3	255	47400	0.897	784 J	47	3520	38	682	NR
29-373-WR-2	5	219	0.5 U	34.9	76.2	65.3	30700	0.285	330 J	62	12	5 U	59	NR
BACKGROUND	10	129	0.6 U	16.6	57.6	28.4	21600	0.029	951 J	51	23	7 U	54	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
29-373-TP-1	0.31	9.68	5.88	-3.8	0.31	<0.01	<0.01	0	5.88
29-373-TP-2	0.19	5.94	2.73	-3.2	0.19	<0.01	<0.01	0	2.73
29-373-WR-1	0.07	2.19	28.9	26.7	0.07	<0.01	<0.01	0	28.9
29-373-WR-2	0.01	0	7.11	7.11	<0.01	<0.01	<0.01	0	7.11

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-373-SW-1	2.34	12.3 JX	2.57 U	9.7 U	6.97 J	1.63 J	43.7 J	0.038 U	4.08 U	12.7 U	0.72 U	30.7 U	7.57 U	20
29-373-SW-2	3.35	12.3 JX	2.57 U	9.7 U	6.83 U	1.7 J	48.6 J	0.038 U	4.08 U	12.7 U	0.89 J	30.7 U	7.57 U	23.1

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-373-SW-1	75	< 5.0	< 5.0	< 0.05	NR
29-373-SW-2	71	< 5.0	< 5.0	< 0.05	< 0.01

LEGEND

SE1 - 800 feet upgradient of tailings pond 1 in S. Meadow Creek.
SE2 - At TPE of tailings pond 1 in S. Meadow Creek.
TP1 - Composite of subsamples TP1A-C and 1A-B.
TP2 - Composite of subsamples TP1A-C and 1A-D.
WR1 - Composite of subsamples WR1, 2A, 2B, 3A, and 3B.
WR2 - Composite of subsamples WR4, 5, and 6.
BACKGROUND - From the Missouri Mine (29-373-SS-1).

SW1 - Same as sample SE1.
SW2 - Same as sample SE2.

XRF ANALYSIS RESULTS

MISSOURI
PA NO. 29-373

Mine Name: Missouri PA# 29–373
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
29–373–SS–1	310.924 *		11714	3556.77		2038.86	40397.5			87.2044 *	43.0107 *	123.458
29–373–TP1A–A	566.698 *		3925.8	1637.66	215.907 *		79216	549.927 *	518.405	891.464	5565.58	58.0636
29–373–TP1A–B	364.316 *		4811.6	1846.06			73515.6	605.639 *	495.821	756.872	5437.66	55.2302
29–373–TP1A–C			1900.29	802.358	139.704 *		32577.8		171.11 *	238.12	1801.62	28.2339
29–373–TP1A–D			1823.36	921.382			37265.5		167.287 *	215.923	2017.58	29.2124
29–373–TP–1–COMP			3741.91	1885.95	244.535 *		78249.9		424.22	824.245	6131.34	60.9692
29–373–TP–2–COMP			2554.07	1250.84	148.009 *		46709		237.417	300.086	2849.38	36.0185
29–373–WR2–A		22579.3	2733.17	1166.1	249.302 *	3848.87	45784		76.5822 *	192.328		255.736
29–373–WR3–A			2464.47	2505.03	238.123 *	1841.13	45166		204.793 *	306.588	968.494	93.3856
29–373–WR3–B	470.781 *		3642.45	2944.87		542.629 *	58401.7		126.835 *	347.236	2035.33	68.8447
29–373–WR–1		23553.8	3335.45	3196.45		1116.6 *	52360.1		307.204	756.758	838.266	106.233
29–373–WR–1–COMP	336.522 *		3310.58	2544.31		1742.72	51768.8		174.602 *	484.062	1058.47	99.7868
29–373–WR–1–COMP–DUP			2929.54	2414.7		1520.32	51188.1		190.725 *	453.509	1175.12	95.0233
29–373–WR–2B	356 $	24552 $	4718 $	3631 $		2991 $	72848 $		244 $	791 $	1853 $	116 $
29–373–WR–2–COMP			24535.7	5051.53		1115.19 *	61560.5			84.1654 *	32.7196 *	143.104
29–373–WR–4			32645.3	4877.74		1299.56 *	72824.6			61.8713 *		202.186
29–373–WR–5			28650	3881.91		961.477 *	56338.4		52.6265 *	57.8283 *	30.8801 *	136.528
29–373–WR–6	338.535 *		8285.05	5133.61	299.956 *	1055.99 *	57549.9			117.232 *	51.3223 *	75.8256

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
29–373–SS–1	170.946				78.6246			231.709			
29–373–TP1A–A	98.328			8778.6	145.224	248.065 *	126.152 *	554.651	212.86 *		28.6959 *
29–373–TP1A–B	102.3			8228.77	132.316	282.124 *	141.577 *	529.278	132.558 *		17.5399 *
29–373–TP1A–C	54.8857			2869.61	77.3584		81.2816 *	245.144			19.6491 *
29–373–TP1A–D	60.0197			3599.22	69.3849		63.5787 *	233.026	149.275 *		22.5132 *
29–373–TP–1–COMP	96.3698			8991.08	124.581		188.193 *	466.375	145.044 *		
29–373–TP–2–COMP	83.5218			4616.8	80.5095	134.745 *	90.5177 *	310.875	90.7309 *		
29–373–WR2–A	174.982			86.5946	99.7336			1036.48	78.6738 *	17.0703 *	
29–373–WR3–A	185.88			519.908	161.008			679.58			9.91322 *
29–373–WR3–B	246.539		6.75676 *	2197.85	194.265		58.4666 *	555.063	104.584 *		
29–373–WR–1	165.322				141.034			541.791	106.734 *	11.6014 *	16.1776 *
29–373–WR–1–COMP	158.706			1412.99	163.045			630.912			
29–373–WR–1–COMP–DUP	160.743			1482.74	175.928			663.127	85.3683 *		
29–373–WR–2B	129 $			3742 $	131 $	196 $	27 $	421 $	169 $	7 $	5 $
29–373–WR–2–COMP	144.838				63.3292			258.381			
29–373–WR–4	118.082				38.4411 *			124.712	99.4346 *		
29–373–WR–5	89.5193				66.3116	171.21 *		228.242			
29–373–WR–6	208.295				94.8736			381.673			

* – Estimated Quantity
$ – Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

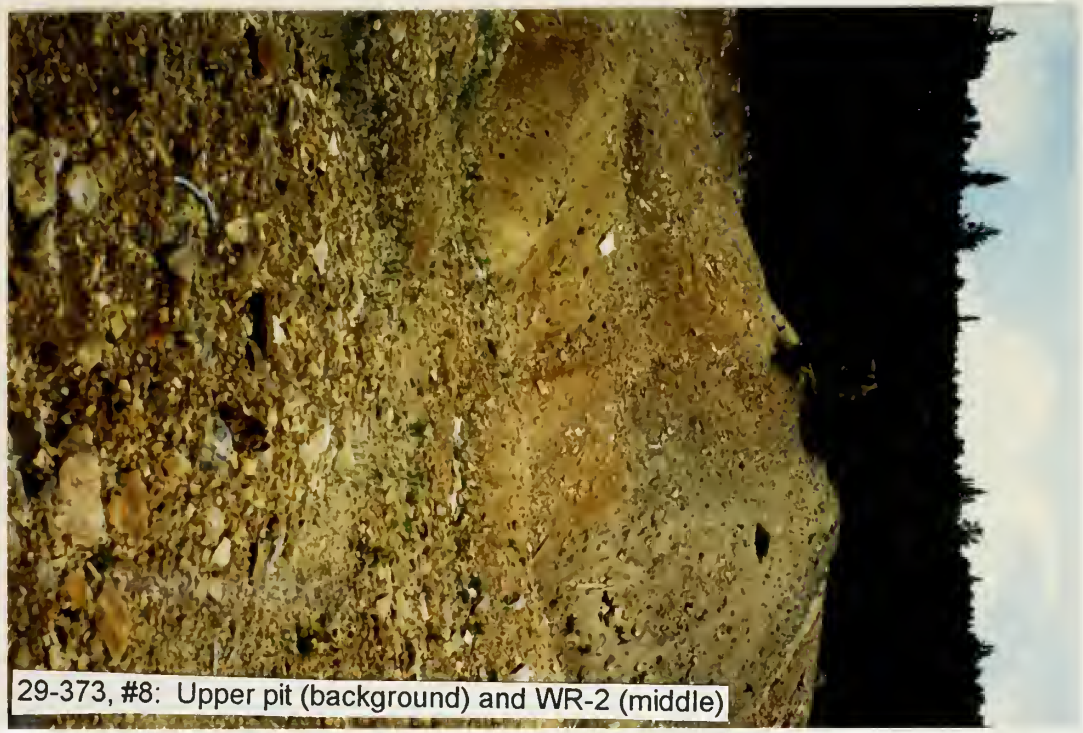
MISSOURI
PA NO. 29-373

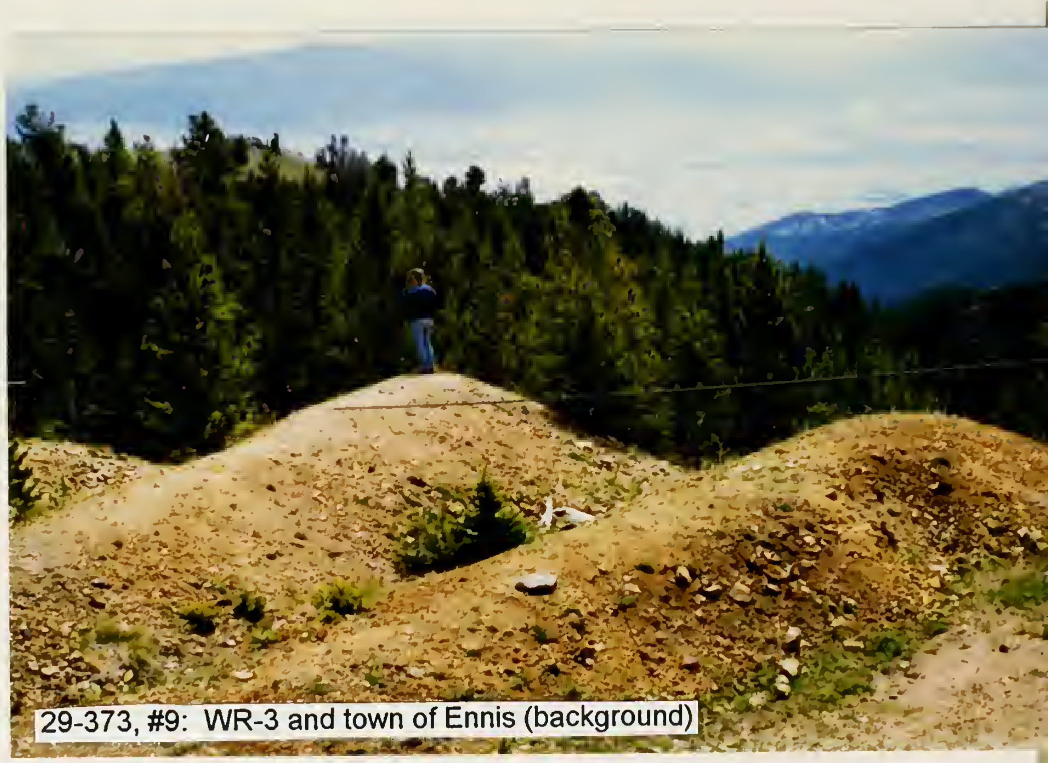
AIMSS SCORESHEET

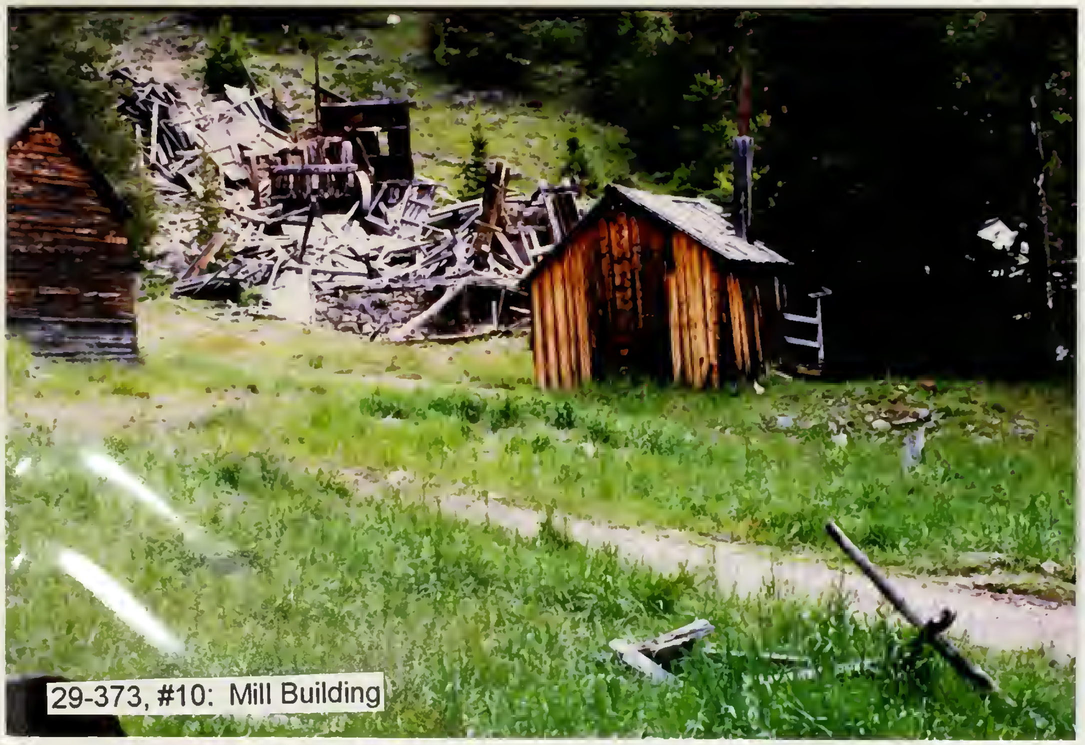
SITE NAME: MISSOURI
PA NUMBER: 29-373

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	101.642
6	GW - TARGETS	WELLS - 1 MI. x 2.5		0.0
7		WELLS - 1 TO 4 MI		17
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	17.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	691166
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	700
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	108.678
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 THRU 22	23
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	1749716
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.565
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 THRU 33	25
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	706
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		50
37A		ACCESSIBILITY		10
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	50
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.526
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		0
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		5
43		TARGETS SCORE	SUM LINES 40 THRU 42	5
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	263
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE**	(LINES 10 + 24 + 35 + 44) / 100,000		**24.42**

			SITE NAME:	MISSOURI
LINE NO.			PA NUMBER:	29-373
		SITE SAFETY		
1	THREAT	ACCESSIBILITY		10
2		OPEN SHAFTS	100 EA.	100
3		OPEN ADITS	50 EA.	50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	75
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	225
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 THRU 11	5
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**11.25**


29-373, #8: Upper pit (background) and WR-2 (middle)


29-373, #9: WR-3 and town of Ennis (background)


29-373, #10: Mill Building

29-373, #11: Tailings

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: SE SE S25 PA#: 29-394

Date: September 20, 1993 Time: 0900

Field Team Leader: M. Babits, Pioneer

Sampling Personnel: S. Babits, Pioneer

Visitors: None

Weather/Seasonality Observations: Windy (5-10 mph); partly cloudy; warm; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #6: Adit at WR-2; #7: WR-1. Video Tape No. 3

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: No need to remediate this site.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): SE SE S25 PA#: 29-394

Legal Description: T 4S ;R 3W ;Sec. 25 , SE1/4 SE1/4 ___1/4

County: MADISON Mining District: WASHINGTON

Latitude: N 45° 27' 18" Longitude: W 111° 54' 20"

Primary Drainage Basin and Code: Madison River/10020007
Secondary Drainage Basin: South Meadow Creek

USGS Quadrangle map name(s): Ramshorn Mountain

Mine Type/Commodities: Hardrock/Unknown

Activity Status: Active___,Inactive/Exploration___,Abandoned X .

Ownership status: Known YX N__; private/public? Public
Owner, Agent, or Contact(Include address and phone when available): USFS

Relationship to other mines/sites in the area/district: The Missouri mine is one mile downgradient from the site.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation 8400' , Slope 35° ,
Aspect South

Land use: Mining___, Recreational X , Residential___, Urban___,
Agricultural X , Other(Specify)

Area of disturbed/unvegetated lands? 0.8 acres.
Dimensions:

Predominant vegetation types: Alpine setting with talus slope

Access: roads - good___,poor___,4wd X ,trail X .
Other logistical considerations (proximity to other sites). Very rough 4WD, then hike 600 feet up the slope.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). South Meadow Creek flows west to east 600 feet to the south 10 miles before entering Ennis Lake. The site is underlain by gneiss, schist, and quartz.

Mining/milling history, ore type/tenor, host rock, gangue: No information available.

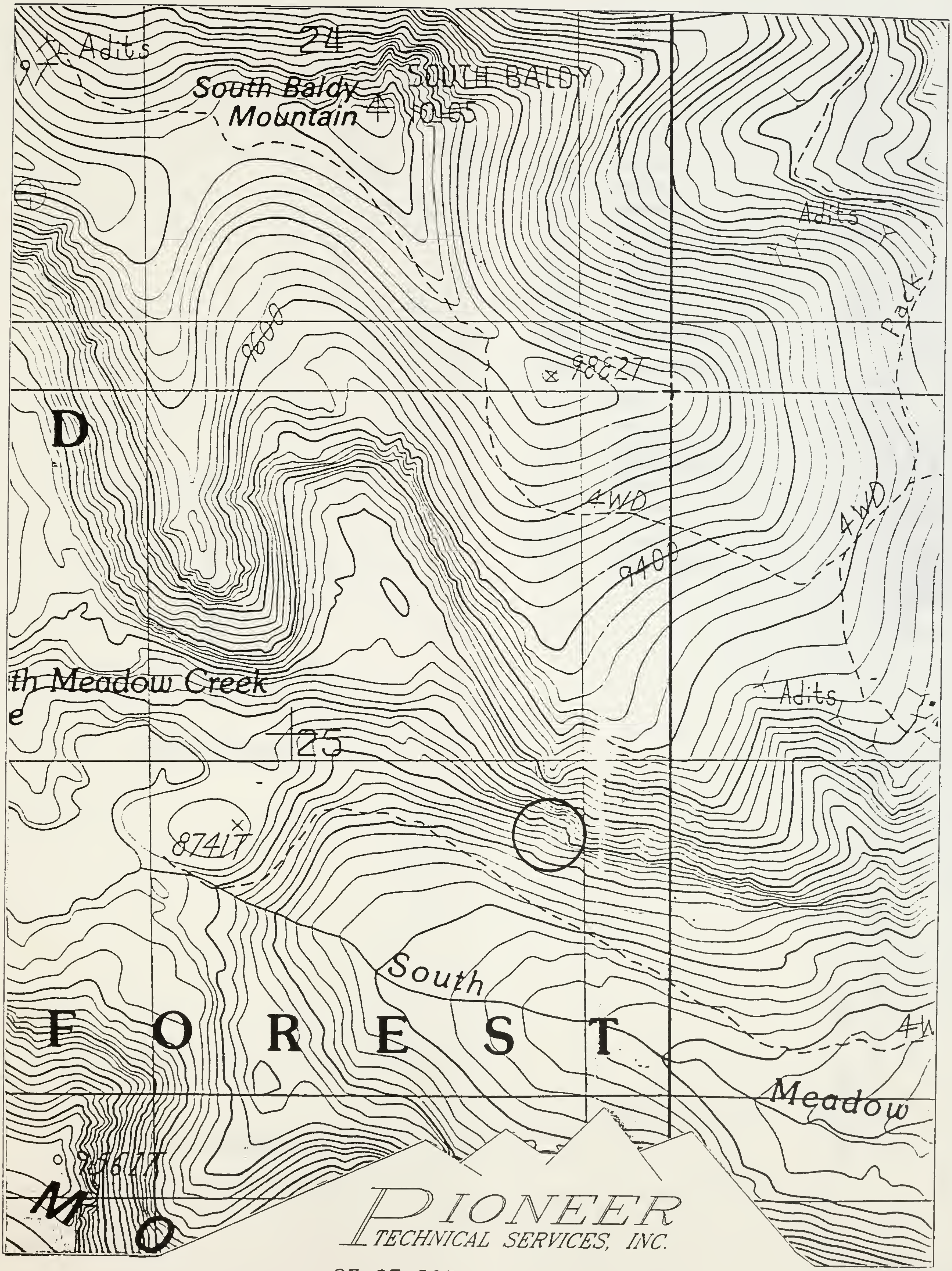
Mine Operation?
Shafts - Yes___, No X, # ___, Comment
Adits - Yes X, No___, # 3, Comment 2 open; 1 partially collapsed
Pits - Yes___, No X, # ___, Comment
Placers - Yes___, No X, # ___, Comment
Other - Yes___, No X, # ___, Comment

Mill Operation? Yes___, No X. If yes answer the next three questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill___ Dedicated Mill___; Number and names of mines that supplied mill feed: N/A

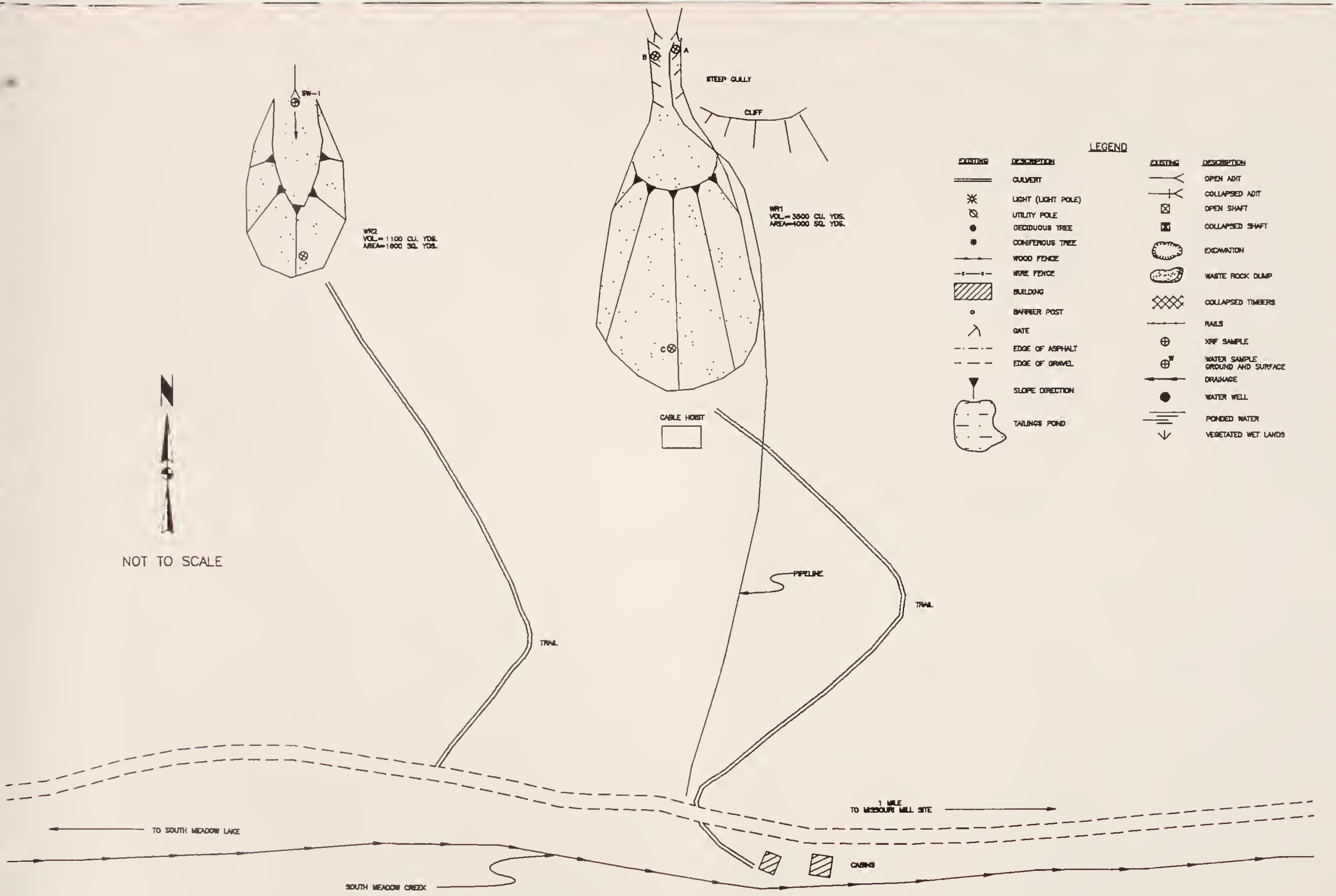
Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting?
N/A



PIONEER
TECHNICAL SERVICES, INC.

SE SE S25, P.A. NO. 29-394

T04S, R03W, SECTION 25
SCALE: 1" = 1000'



DRAWN JTP DATE 18 OCT 93
DESIGNED TPR JOB NO. 93-17
APPROVED WJB F.B. NO.

PIONEER
TECHNICAL SERVICES, INC. BUTTE, MT.

TD&H
THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS–BOZEMAN–KALISPELL MONTANA
SPOKANE WASHINGTON

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY
SE SE SECTION 25 PA# 29-394
WASHINGTON DISTRICT MADISON COUNTY

SHEET NO.

29-394.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: M. Babits, S. Babits

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	3,500	Top of pile to the east	None	6.8 (D)	0.05	29-394-WR-1	09/20/93 1420	T-Metals, ABA
WR-1B	WR		Top of pile to the west	None	6.7 (D)	0.03			
WR-1C	WR		Center of the bottom of the pile, near cable hoist	None	7.0 (D)	0.04			
WR-2	WR	1,100	West of WR-1; center of the bottom of the pile	None	7.0 (D)	0.04			

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 29-394-WR-1 is composite of WR-1A through -1C, and WR-2.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X , No___, Number: 1 Identification: At WR-2

Filled shafts: Yes___, No X , Number:____ Identification:__________

Seeps/Springs: Yes___, No X , Number:____ Identification:__________

Groundwater wells within 4 miles?: Yes X , No___;
Number of well logs: 13

Distance to nearest well used for drinking? 3.5 miles

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible____, Unlikely X .
Uncontained source with deep depth to groundwater.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: M. Babits, S. Babits

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	AD	Adit discharge at WR-2	< 1 gpm (E)	7.75	127	132	5.8	42	N/A	29-394-SW-1	09/20/93 0950	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes____, No X , Name(s):

Dry streambeds: Yes____, No X , Name(s):

Other surface water: Yes____, No X , Name(s)/Description:

Waste materials within any floodplain: Yes____, No X Source ID(s):

Approximate Flood frequency?___1 yr,___10 yr,___100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A
High Flow:__________, Average Flow:__________

Distance between waste source(s) and nearest surface water body (ft)? 600 feet

Surface water draining onto or through waste sources: Yes X , No____,
Describe: Adit discharge flows over WR-2.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Fishery, wetland, irrigation, agriculture

Observed erosional/sedimentation/stream turbidity problems? Yes_____,
No X , Distance downstream (ft)?________ Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):

SURFACE WATER INVENTORY FORM

SAMPLERS: ______

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.											

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ______

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 0

Wetlands present: Yes___, No X, Describe:

Carbonate rocks/soils: Yes X, No___, Describe: Carbonate precipitate

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30 X; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence(ft or miles)? 3.5 miles

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: M. Babits, S. Babits

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	None	Moist	36,000	36,000	Yes	Low
WR-2	None	Moist	14,400	14,400	Yes	Low
SW-1	None	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications: ______________________________

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No_X_,
Describe:______________________________

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___;
300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments_None____________________

Evidence of recreational use on site: Yes___, No_X_, Describe:________

Accessibility - Fences, warning signs, closed roads?_Unrestricted___

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment__________
Wilderness Area - Yes___, No_X_, Comment__________
T&E Species Habitat - Yes_X_, No___, Comment_Bald Eagle_______
Bat Habitat - Yes___, No_X_, Comment__________

Primary Drainage___; Secondary Drainage_X_; No Information___:

Riparian Habitat Quality - High_X_, Medium___, Low___
Wetlands Frontage - High_X_, Medium___, Low___
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _3_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_2_, types and locations:___
One adit at WR-1 and one adit at WR-2; both are open.

Hazardous structures: Yes___, No_X_, Number____, types and locations:_

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____,
types and locations:______________________

Unstable waste piles, impoundments, undercut banks: Yes____, No_X_,
Number____, types and locations:______________________

Fire and/or Explosion hazards: Yes___, No_X_, Explain:______________

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for SE SE Sec. 25, Prepared by Chen-Northern, August 14, 1989.

USGS, Topographic Map, Ramshorn Mountain, Montana, 7 1/2 minute Quadrangle, 1988.

LABORATORY ANALYTICAL DATA

SE SE S25
PA NO. 29-394

SE SE Section 25 PA# 29-394
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BABITS
INVESTIGATION DATE: 09/20/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
29-394-WR-1	1110	109	7	52.6	46.5	525	59400	0.221	1700 J	61.3	1660	23 J	1090	NR
BACKGROUND	10	129	0.6 U	16.6	57.6	28.4	21600	0.029	951 J	51	23	7 U	54	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
29-394-WR-1	0.2	6.25	2.89	-3.4	0.14	<0.01	0.07	0	2.89

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
29-394-SW-1	32.9 J	3.73	4.59 U	5 U	6.24 U	13.1	20.3 JX	0.12 U	3.76 UJ	10.9 U	2.78 J	31.7 U	59.9	35.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
29-394-SW-1	61	< 5	8	0.11	NR

LEGEND

WR1 - Composite of subsamples WR1A, 1B, 1C, and 2.
BACKGROUND - From the Missouri Mine (29-373-SS-1).
SW1 - Adit discharge at waste rock dump 2.

XRF ANALYSIS RESULTS

SE SE S25
PA NO. 29-394

Mine Name: SE SE Section 25 PA# 29–394
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
29–394–WR1–A	413.537 *	53507.4	2456.59	6725.35			20209.8			179.207	2399.28	34.7487
29–394–WR1–B	503.012 *	6036.29	5776.94			12152.3	326238		1749.98	7368.41	289.312 *	59.8992
29–394–WR1–C		19363.5	8215.55	3436.45	290.484 *	862.196 *	53513.2			192.748	1287.81	144.675
29–394–WR–1–COMP	427.467 *	26541.9	5481.16	1834.77		3489.04	104750		353.617	1122.81	1813.11	84.1481
29–394–WR–2		27773.7	6349.15	4591.52	195.016 *	2203.05	74996.7		153.8 *	469.856	2243.59	55.4438

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
29–394–WR1–A	205.254		17.208	4186.63	189.476		223.894	563.42	165.07 *		14.424 *
29–394–WR1–B	40.5303		18.4215 *	3758.35	60.0586 *			663.618	348.507 *	15.1119 *	
29–394–WR1–C	143.887			1467.03	105.564		137.294 *	389.859	164.41 *		
29–394–WR–1–COMP	180.986		6.02598 *	2213.09	139.34		218.557 *	380.344	145.91 *	10.2426 *	
29–394–WR–2	183.955		5.76393 *	1148.81	156.737		260.016	429.279			

* – Estimated Quantity
$ – Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

SE SE S25
PA NO. 29-394

AIMSS SCORESHEET

SITE NAME: SE SE SECTION 25
PA NUMBER: 29-394

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		2
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	40
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	40
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	8.341
6	GW - TARGETS	WELLS - 1 MI. x 2.5		0.0
7		WELLS - 1 TO 4 MI		13
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	13.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	4337
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	40
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	40
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	8.970
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		5
23		TARGETS SCORE	SUM LINES 16 THRU 22	23
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	8252
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		1
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	5
27		LIKELIHOOD SCORE	LINES 25 + 26C	5
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.298
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		5
34		TARGETS SCORE	SUM LINES 29 THRU 33	25
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	37
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		0
37A		ACCESSIBILITY		5
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	25
38		LIKELIHOOD SCORE	LINES 36 + 37C	25
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.277
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		0
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 THRU 42	0
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	0
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000			**0.13**

SITE NAME: SE SE SECTION 25
PA NUMBER: 29-394

LINE NO.		SITE SAFETY		
1	THREAT	ACCESSIBILITY		5
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	100
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 THRU 7	100
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 THRU 11	0
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**0.00**

29-394, #6: Adit at WR-2

29-394, #7: WR-1